

**National Park Service
U.S. Department of the Interior**

**Rocky Mountain National Park
Colorado**



Bark beetle Management Plan Environmental Assessment



February, 2005

Environmental Assessment

Bark beetle Management Plan

Rocky Mountain National Park • Colorado

Summary

Bark beetle infestations are killing ponderosa, lodgepole, and limber pine trees and spruce trees throughout Colorado. Infestations, due in large part to continuing drought, are increasing in Rocky Mountain National Park (RMNP). Areas of concern include the park's southwest corner, close to a northerly infestation spread from Arapaho National Recreation Area and developed areas throughout the park, such as campgrounds and visitor centers. Weakened, infested trees become safety hazards, reduce aesthetic values, increase wildfire danger, and may cause property damage within the park and to adjacent landowners.

RMNP proposes a proactive approach in managing two genera of bark beetles, *Dendroctonus* and *Ips*, before they become a serious threat. This plan identifies RMNP bark beetle management goals as well as strategies to protect high-value trees in developed areas, while reducing fire risks in wildland urban interface (WUI) areas and cooperating with adjacent landowners to accomplish common goals.

Two alternatives are presented: 1) the No Action Alternative is the continuation of current bark beetle management using Integrated Pest Management (IPM) techniques such as mechanical removal, thinning, sanitation, watering, mistletoe removal, and prescribed fire; and 2) the Preferred Alternative which includes the above techniques as well as the use of an insecticide applied to trees as a bark beetle repellent to protect certain. Pheromone use would also be permissible if proven effective. A third alternative, which would expand the area to be treated, was considered but dismissed.

The Preferred Alternative would have negligible, minor, or moderate impacts on soils and vegetation; natural soundscape; aquatic, wetland and riparian communities; endangered, threatened and rare species; wildlife; wilderness, air quality, archeological resources; cultural landscapes, visitor experiences, park operations, and human health and safety. Long-term benefits from effective protection under the Preferred Alternative outweigh short-term adverse impacts under the No Action Alternative. Alternative 2 is the environmentally preferred alternative.

Public Comment

If you wish to comment on this Plan or EA, you may mail or deliver comments to the addresses below. Our practice is to make comments, including names and home addresses of respondents available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. We will make all submissions from organizations or businesses, available for public inspection in their entirety.

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- B: Endangered Species Act (ESA) Threatened and Endangered Species Unit List for Rocky Mountain National Park
- C. U.S. Fish & Wildlife Service Concurrence Letter
- D: State Endangered, Threatened, and Rare Species List for Rocky Mountain National Park
- E: List of sources used by Rocky Mountain National Park to identify Endangered, Threatened and Rare Species that must be protected if found within the proposed project site

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CHAPTER 1 PURPOSE AND NEED

Park Mission

The mission of Rocky Mountain National Park (RMNP) is rooted in its enabling legislation. The 1915 Act (38 Stat. 798) creating RMNP states that regulations governing the use of the park are to be *“primarily aimed at the freest use of the said park for recreation purposes by the public and for the preservation of the natural conditions and scenic beauties thereof.”*

As a unit of the National Park System, legislation mandates that park resources are to be managed in such manner as will leave them unimpaired for the enjoyment of future generations (NPS Organic Act of August 25, 1916). RMNP's mission is the care, protection, management, improvement, understanding and interpretation of park resources while maintaining positive visitor experiences.

Location and Access

RMNP, located in north central Colorado, encompasses 265,780 acres. The park lies within Larimer, Boulder, and Grand Counties and is bordered by the towns of Estes Park, Allenspark, and Glenhaven on the east and Grand Lake on the west. The park is surrounded by state, local, private, and federally owned lands. About 62 percent of the park borders national forest land, most of which is managed as wilderness. Nearly 60 percent of the park is forested, dominated by lodgepole pine and spruce/fir trees.

The park is easily accessible from the Denver metropolitan area, 65 miles to the southeast. Interstates 25, 70 and 76, which converge in Denver, provide access for visitors coming from all regions of the United States. Local thoroughfares accessing the park include State Highways 7, 34, and 36. RMNP's proximity to populous Front Range communities has resulted in steadily increasing visitation. RMNP receives nearly 3.5 million visitors annually.

Purpose

Rocky Mountain National Park (RMNP) is examining ways to manage bark beetle infestations that are threatening high-value trees in developed areas, Wildland Urban Interface (WUI) Fuel Management areas, National Historic districts, and areas within the park adjacent to private lands. The National Park Service proposes a proactive approach in managing bark beetles in specific areas of the park before they become a serious threat to high-value trees. Dead standing trees killed by bark beetles are a safety hazard to park visitors and employees. The goals of the Bark beetle Management Plan in Rocky Mountain National Park are to:

- Protect high-value trees in developed high-use areas of the park;
- Protect the safety of park visitors and employees from hazardous trees killed by bark-beetles;
- Reduce fire risk in identified WUI fuel management areas; and
- Cooperate with adjacent landowners in minimizing risks to high-value trees on private land.

Need

During the last three years, bark beetle infestations have increased tenfold throughout the western U.S., largely in response to a continuing drought. The number of beetle-infested and killed trees within the park has steadily increased within the past two years. Affected trees pose a threat to human safety and property from the blow down of weakened trees and increased wildfire risk. Removing affected trees and preventing additional infestations of high-value trees is needed in order to minimize adverse impacts.

A severe bark beetle outbreak in the Arapaho National Recreation Area, contiguous to the southwest border of RMNP, is posing an immediate threat of mortality to dense lodgepole pine forests on the west side of the park. On the park's east side, increasing populations of the *lps* beetle are causing significant loss of high-value trees in developed, high use areas, such as the Moraine Park Campground. Spruce, ponderosa pine, and lodgepole pine are all at risk (Jeff Witcosky, personal communication, 10/2003).

Figure 1 shows areas within and adjacent to the park currently affected by bark beetles and areas proposed for management.

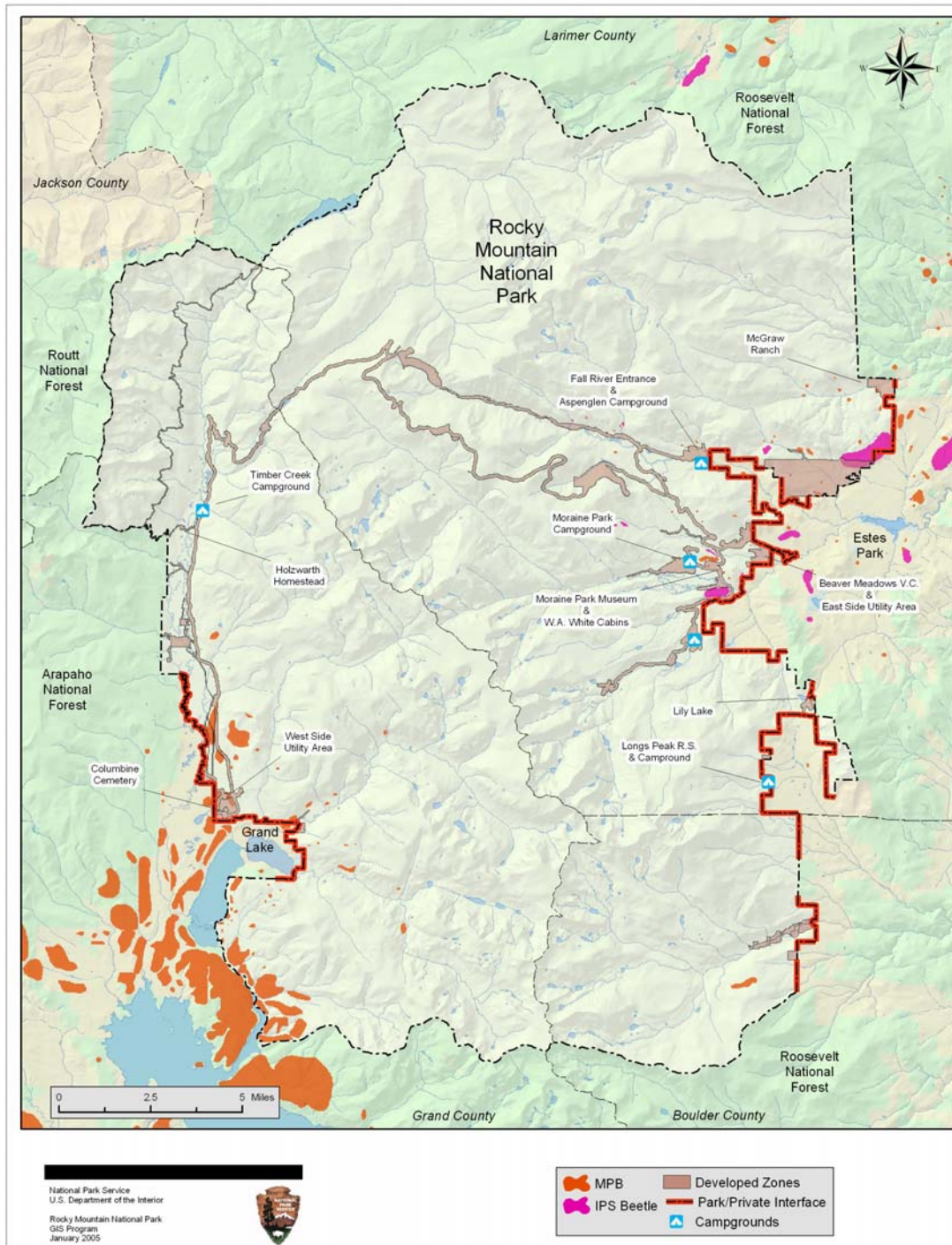


Figure 1

The purpose of the Bark beetle Management Plan and EA is to protect the visual character, screening, and other important qualities that trees provide throughout RMNP, particularly in developed and culturally-significant areas. In addition, the Plan aims to reduce or remove hazardous trees infested with, or killed by, bark beetles to reduce safety hazards. Equally important is the preservation of natural processes related to native bark beetles throughout the rest of the park in recommended or designated wilderness, which comprises about 95 percent of total park lands.

Bark beetle Background

Bark beetles (*Dendroctonus* and *Ips*) are native species that have evolved with local forest ecosystems. Periodic outbreaks of native bark beetles have occurred for thousands of years. Though pine beetles cause a substantial loss of trees, they are recognized as part of “*natural conditions*,” within RMNP’s enabling legislation. Infested and dead standing trees are valuable to wildlife. However, in certain locations, beetle-infested trees can cause serious problems:

- Dead standing trees can blow over and pose safety risks to people and property within developed areas of the park.
- Dead trees can compromise the integrity of cultural landscapes, where it is important to maintain large mature trees.
- Dead trees can decrease private property values within and surrounding the park.
- Dead trees contribute to forest fuels, leading to extreme fire behavior in WUI Fuels Management areas.

There are 16 species of bark beetles currently attacking evergreen trees in Colorado. All have potential to infest trees within RMNP (Appendix A). Bark beetle susceptibility is evaluated on stand structure, age of stand, forest density, diameter of trees, proximity to existing infestations, elevation, and the general forest health (stress due to drought, dwarf mistletoe, fire, etc.) Presently, RMNP meets all the criteria for a major outbreak to occur.

RMNP has been managing bark beetle infestations for several years. Recent activities have focused on removing hazardous trees and protecting high-value trees in Moraine Park and Timber Creek campgrounds. Monies collected from entrance fees were used to conduct the work, performed by park staff, fire crews, the Colorado Mountain Club, and volunteers. Infested green bark beetle trees are the first priority for removal, followed by beetle-killed hazardous trees.

Female bark beetles seek live green trees and typically attack on the lower 15 feet of the trunk. Females initiate attacks by means of a pheromone (a message-bearing chemical), that attracts mates and other females. Within hours, a successfully attacked tree becomes the site of a “mass attack” and the focal point of what may become a group of beetle-killed trees. Infestations can include individuals or groups of trees depending upon the health of the stand, environmental conditions, and nearby populations of beetles. Once bark beetles infest a tree, nothing practical can be done to save it.

Beetles generally attack new trees in June or July, when they bore tunnels under the bark and lay eggs. An individual female may lay more than 100 eggs. Following egg hatch, larvae construct feeding galleries in the phloem, or inner bark of the tree. These galleries eventually girdle and kill the tree by cutting off the exchange of nutrients between the tree’s roots and crown. The larvae spend approximately 8 months feeding before transforming into pupae. New adults emerge July through September, when they repeat the process.

Some bark beetles transmit bluestain fungi. Their spores contaminate adult beetles and are introduced into the tree during attack. Fungi growing within the tree interfere with tree’s ability to make pitch and expel beetles. This network of beetle galleries and fungi disrupts the tree’s defenses and rapidly kill it. (Degomez and Young 2002, Hastings et al. 2001, Dave Leatherman, personal communication)

Scoping

Scoping is an open process that helps identify environmental issues and alternatives. RMNP participates in an informal network with experts in the NPS, United States Forest Service (USFS),

and Colorado State Forest Service along with bark beetle experts, adjacent landowners, local communities, and the Colorado Coalition for Alternatives to Pesticides to address bark beetle management. Park staff conducted/attended the following meetings:

February 10, 2004 RMNP Biologist met with the Grand Lake Landowners to discuss mountain pine beetle management. The 2-hour meeting was attended by 60 participants.

February 17th, 2004 RMNP Chief of Resource Management and Fire Education, Prevention and Information Specialist attended the Grand Lake Fire Protection District Public Education series, hosted by the Grand Lake Fire Department, the USFS, and private mitigation contractors. The group addressed forest health and bark beetle management.

February 24, 2004 RMNP Biologist presented bark beetle management information in RMNP's "Resource Rendezvous," a monthly newsletter on natural and cultural resources distributed to all employees.

March 19, 2004 Park officials met with NPS Regional Entomologist, Bob Cain, to evaluate bark beetle activity on the Colorado River District of the park. Cain confirmed the high risk of this area for beetle infestations due to high density and large diameter of trees and close proximity to an ongoing outbreak in Arapaho National Recreation Area.

June, 2004 The "Resource Rendezvous," containing bark beetle information/management in RMNP was distributed to members of the U.S Senate and House, Colorado State Legislators, conservation agencies, federal and state agencies, local community leaders, research cooperators, intergovernmental managers, fire cooperators, special interest groups, RMNP concessionaires, and Rocky Mountain Nature Association Board of Directors/staff.

November, 2003 and June, 2004 RMNP biologists conducted two training sessions with park employees and volunteers on all aspects of bark beetle management.

Through meetings and scoping, the following issues surfaced:

- The use of chemicals (insecticides) in RMNP
- Timing of chemical application to achieve maximum effectiveness while avoiding peak visitation
- Cost of spraying insecticides, ranging from \$4,000-10,000 per year during an attack
- Additional cost of non-pesticide application by seasonal work crews (\$25,000 - \$30,000)
- Increased slash pile burning of infested trees during winter months

Impact Topics Retained for Further Analysis / Affected Environment

The following impact topics were raised and will be analyzed in this EA.

Soils and Vegetation – Affected Environment

According to the National Park Service's *2001 Management Policies*, the National Park Service strives to understand and preserve soil resources and features from adverse affects of human activity, while allowing natural processes to continue. In order to assess the potential disturbance to soils, an Order 2 soil survey was completed in Rocky Mountain National Park's lower elevations and an Order 3 soil survey was undertaken for other areas of the park (Natural Resources Conservation Service, 1999.) Nine types of soils with varying degrees of runoff and permeability occur in areas proposed for bark beetle management.

According to the National Park Service's *2001 Management Policies*, the National Park Service strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of plants (NPS 2000).

Sixty percent of RMNP is forested. Lodgepole pine and ponderosa pine trees are the primary hosts of bark beetles in RMNP. On the west side, dense stands of lodgepole pines are at great risk of mortality due to

infestations spreading north from the Arapaho National Recreation Area. Infested lodgepole pines are located in the Kawuneeche Valley area, including the Kawuneeche Visitor Center, Timber Creek Campground, and along roadsides. On the east side of the park, ponderosa pine trees are affected in developed areas, such as Moraine Park Campground, Beaver Meadows Visitor Center, the utility area, McGraw Ranch, and along roadsides.

Other host trees in the park include limber pine and Colorado blue spruce and Engelmann spruce trees, but threats to these species are currently low. Generally, bark beetle outbreaks in RMNP are likely to occur in:

- Lodgepole pine stands that contain well-distributed, large-diameter (8" or more) trees;
- Dense stands of pole-sized ponderosa pine;
- Limber pine colonizing areas such as ridgetops; and
- Drought-stressed Colorado blue spruce.

Plants and grasses at the base of infested trees requiring bark beetle management are also affected. These include, but are not limited to mountain mahogany, juniper grass, antelope bitterbrush, and cinquefoil.

Natural Soundscape

In accordance with National Park Service *Management Policies* (2001) and Director's Order #47, *Sound Preservation and Noise Management*, preservation of natural soundscape is an important mission of the NPS. Natural soundscapes occur in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all natural sounds within the park, together with the physical capacity for transmitting natural sound through air, water, or solid material. RMNP strives to preserve the natural soundscape associated with the physical and biological resources of the park. From elk bugling to thunderous waterfalls, natural sounds of RMNP contribute to a sense of wilderness and solitude, important to park visitors and are therefore critical to protect.

Most beetle control activities occur in developed areas. Recommended or designated Wilderness comprises 95 percent of the park, where few if any bark beetle management activities would occur, and only if infestations threaten adjacent private landowners.

Aquatic, Wetland, and Riparian Communities

Executive Order 1190 *Protection of Wetlands* requires federal land management agencies to avoid, where possible, adversely affecting wetlands. NPS policies for wetlands, stated in *2001 Management Policies and Directors Orders* and Director's Orders 77-1, *Wetlands Protection*, strive to prevent loss or degradation to wetlands and to preserve and enhance the natural and cultural beneficial values of wetlands.

Pine trees susceptible to bark beetles are usually located in upland habitat, but may be near or adjacent to aquatic, wetland and riparian communities. Colorado blue spruce, though currently not threatened by bark beetles, can be found in moist environments adjacent to aquatic, wetland and riparian habitat. Wetland communities provide some of the greatest diversity for flora and fauna in the park. Though these areas will be avoided, the potential exists for chemical repellants to enter open water through runoff and spills. This topic will be retained for analysis.

Endangered, Threatened and Rare Species (T&E and rare species)

The Endangered Species Act (1973) requires an examination of impacts on all federally-listed threatened or endangered species. NPS policy also requires examination of impacts on federal candidate species as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species. (NPS Management Policies § 4.4.2.3).

In December of 2003, RMNP developed a list of threatened and endangered species that is specific to the park. The list includes species that are known to occur in the park or could potentially occur in the park, and species that occur outside the park, but could potentially be affected by actions within the park.

The list can be found in Appendix B. On January 15, 2004, the U.S. Fish & Wildlife Service (USFWS) concurred with the RMNP list. (Please refer to Appendix C). Appendix D is the list of State Endangered, Threatened, and Rare Species for RMNP. Appendix E is a list of sources used by RMNP to identify Endangered, Threatened, and Rare Species. All of the listed species were considered during the development of this EA.

No federally endangered and threatened plant and insects are known to occur in proposed bark beetle treatment areas, however potential exists to encounter them. Treatment areas would be surveyed to determine their presence and proximity before work proceeds. There are four state-imperiled butterflies in Colorado (Appendix D), but none are known to exist within bark beetle project areas.

The federally-threatened and state-endangered and critically-imperiled Canada Lynx has been recently reintroduced into southwest corner of Colorado. The Colorado Division of Wildlife has 19 records of 4 radio-collared lynx moving north from their release site and spending some time in or near RMNP between Oct 8, 1999 and April 28, 2000. Since April 2000, there have been other documented occurrences of lynx in the park with the latest noted on October 6, 2004. Rocky Mountain National Park provides prime habitat for the Canada lynx and future sightings are expected. Extensive surveys have not documented a relic population of the lynx within park boundaries.

The northern goshawk, listed by the state as vulnerable during its breeding season, hunt and forage in dense lodgepole pine forests where beetle management activities occur.

Three endangered, threatened or rare species reside within RMNP, but do not occur in areas proposed bark beetle management. These include: 1) Bald eagle, *Haliaeetus leucocephalus* – federally and state threatened, 2) Boreal toad, *Bufo boreas* – candidate for federal listing and state-endangered and critically imperiled; and 3) Greenback cutthroat trout, *Onocorhynchus clarki stomias* – federally threatened and state imperiled and vulnerable. These species will not be affected by bark beetle management activities and no further analysis will be included in this EA.

Wildlife

The National Park Service's *2001 Management Policies* direct national parks to maintain all components and processes of naturally evolving ecosystems, including the natural abundance, diversity, and ecological integrity of plants and animals (NPS 2000). Common wildlife species in bark beetle project areas include deer, elk, bighorn sheep, moose, chickarees, coyotes, bobcats, mountain lions, chipmunks, and ground squirrels.

RMNP was designated a Globally Important Bird Area in 2000 due to the diversity of birds and breeding habitat for species of high concern.

Bark beetles provide benefits for some mammals. Infested trees provide food, roosting, and nesting sites for cavity-nesting birds, such as woodpeckers, swallows, bluebirds, chickadees, and nuthatches. These trees also create habitat for snowshoe hare, Nuttall's cottontail, and other small mammals. These animals may be disturbed by beetle management activities.

Wilderness

Wilderness management programs and policies apply to parks that have designated wilderness, potential wilderness, and recommended/study wilderness (NPS-41). NPS policies state: "*The NPS will take no action that would diminish the wilderness suitability of an area recommended for wilderness study or for wilderness designation until the legislative process has been completed.*" (USDI-NPS Management Policies Chapter 7:2, 2001, NPS-41). RMNP manages most of its land as though it was designated as Wilderness, even though only a small part of the part has been actually designated as Wilderness. Management areas within the park include recommended wilderness (94 percent of the total park area), designated Wilderness (1 percent of the total park area), and administrative areas (5 percent of the total park area). Most bark beetle management would occur within the administrative area of the park, which lies outside recommended or designated Wilderness.

Bark beetle management activities would occur in Wilderness only when infestations threaten high-value trees on adjacent private lands. Control work would be limited to 150 feet within the park boundary and initiated solely upon the request of adjacent landowners.

Air Quality

The Clean Air Act (42 Section 118 of the 1963 Clean Air Act (42 U.S.C. 7401) requires a park unit to meet all federal, state, and local air pollution standards. Further, it provides that federal land managers have an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts. RMNP is designated a mandatory Class I area. Visibility is noticeably impaired in the park 90% of the time. Pollutants can be traced to the populated Front Range of Colorado, but possibly as far away as Mexico, Texas, and California.

Bark beetle management activities will occur in developed areas, where use of chainsaws, prescribed burns, and chemical application can affect air quality.

CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act, as amended in 1992 (16USC 470 *et seq.*) and the National Park Service's Director's Order 28 *Cultural Resource Management Guidelines* require the consideration of impacts on historic properties that are listed on or are eligible to be listed on the National Register of Historic Places. They also require federal agencies to coordinate with State Historic Preservation Officers regarding the potential effects their actions could have on historic properties listed on or could be potentially be eligible for listing on the National Register of Historic Places. For the purposes of this discussion, cultural resources include: Archeological resources, Historic Structures, and Cultural Landscapes.

Archeological Resources

To date, archeological surveys of about 17 percent of the park (43,865 acres) have located about 300 prehistoric and 700 historic archeological sites. The area that now comprises RMNP has been occupied by human beings for some 10,000 years. Archeological sites include prehistoric occupation sites, high altitude game drives, culturally-peeled trees, vision quest sites and other Native American religious sites, historic ranches, resorts, mines, sawmills, six prehistoric trails, and two mining towns.

All developed areas in the park have been surveyed and no known archeological resources are known to occur in areas proposed for bark beetle management activities, though potential exists for them to be encountered. Mitigation measures will ensure that if archeological resources are found within beetle management areas, activities will cease until a qualified archeologist determines that it is okay to proceed.

Cultural Landscapes

According to the National Park Service Director's Order 28 *Cultural resource Management Guidelines*, a cultural landscape is a reflection of human adaptation and use of natural resources and is expressed in the way land is organized, patterns of settlement, land use, systems of circulation, and types of structures that are built. Cultural landscape features include buildings, structures (roads, trails, bridges, ditches, and fences), native vegetation, historic plantings, ponds, wildlife, and viewsheds.

While the park has only one designated cultural landscape at McGraw Ranch (10 acres), the park's historic districts are viewed as cultural landscapes for management purposes, including: Utility Area, William Allen White, Deer Haven, Holzwarth Homestead/Never Summer Ranch, McGraw Ranch, Fall River Entrance, and Green Mountain /Onahu ranches. Similarly, road corridors and trails should be managed to protect historic landscape features.

The park also contains isolated historic buildings throughout the front and backcountry. While the areas around these cabins are not considered landscapes, the trees surrounding them often define the setting and feeling of the building, two important aspects of National Register properties.

A main feature of the Bark beetle Management Plan is to protect high-value trees in historic areas throughout the park. The top priorities for control include: McGraw Ranch, William Allen White cabin, the Beaver Meadows Visitor Center, and the Holzwarth Homestead/Never Summer Ranch. Other control activities would occur in the Utility Area, Deer Haven, the Lieffer Cabin, and along Trail Ridge Road.

Bark beetle management will continue during the life of this plan in culturally-significant areas as listed above. The significance of trees to the cultural landscape in these areas would be carefully considered and documented before removal or other control activities take place to maintain forest health.

Visitor Use and Experience

According to *2001 Management Policies*, the enjoyment of park resources and values by people is a part of the fundamental purpose of all park units (NPS 2000). This policy also states that scenic views and visual resources are considered highly valued characteristics that the National Park Service should strive to protect. NPS is committed to providing high quality opportunities, appropriate to the superlative natural and cultural resources in RMNP.

Recreation has been a popular pursuit in RMNP for over 90 years through today, where annual visitation is 3,000,000 people. Camping and picnicking are prime activities in the park and sites fill up from Memorial Day to Labor Day. Protection of high-value trees in campgrounds and picnic areas is important to visitors as trees provide shade and screening from nearby sites. Bark beetle control activities are proposed in all campgrounds, picnic areas, and along road corridors. Proposed insecticide application would take place in late summer, after peak visitation, and could last through December. Slash removal and burning would follow, occurring before June when visitation is highest.

A yearlong visitor survey revealed that tranquility, clean air, clean water, scenery, and wildlife are extremely important attractions for RMNP visitors (Valdez, 1996) and these qualities will be carefully considered prior to and throughout bark beetle management activities.

Human Health and Safety

Bark beetle-infested and killed trees can become weakened and may blow down or topple over, which is a safety hazard. Additional fuel loads from downed beetle-killed trees could also increase fire danger, affecting public safety within and adjacent to the park.

Public health and safety are of prime concern associated with the application of insecticides, especially related to human exposure through respiratory, dermal or dietary routes (touching or eating berries with residues) when they are released into the air and water. An insecticide would be used only as a last resort. Mitigation measures would help to ensure that people are not exposed to insecticides.

Park Operations

The superintendent at RMNP is responsible for the full scope of managing the park, its staff and residents, all of its programs, and its relations with people, agencies, and organizations interested in the park. This includes a variety of activities to accomplish management goals and meet requirements in law enforcement, emergency services, public health and safety, research and science, resource protection and management, visitor services, interpretation and education, community services, utilities, housing, fee collection, and administrative support.

RMNP has committed funding, staff, and resources to inventory, monitor, and maintain resources contributing to the overall health of forest ecosystems, including exotic plant management, fuel reduction, and bark beetle management. These activities will continue, in consort, to accomplish the mission of RMNP, preservation of resources and enjoyment of those resources for present and future generations of

park visitors. A key component of managing bark beetles is also fostering cooperation with adjacent landowners to achieve mutual goals.

Impact Topics Dismissed from Further Analysis

Prime and Unique Farmland

In August, 1980, the Council on Environmental Quality (CEQ) directed that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's Natural Resource Conservation Service as prime or unique. Prime or unique farmland is defined as soil that particularly produces general crops such as fruits, vegetables, and nuts. According to the Colorado Department of Agriculture, the soils comprising RMNP are used for wildlife habitat and are not considered to be prime or unique farmlands. Thus, prime and unique farmland is not addressed as an impact topic.

Floodplains

Executive Order 11988 *Floodplain Management* requires all federal agencies to avoid undertakings within the 100-year floodplain unless no other practical alternative exists. The National Park Service under *2001 Management Policies* and Director's Order 77-2 *Floodplain Management* strives to preserve floodplain values and minimize hazardous floodplain conditions.

Bark beetle management activities will not occur within a 100-year floodplain; therefore a Statement of Findings for floodplains will not be prepared and the topic has been dismissed.

Natural Lightscape

In accordance with *2001 Management Policies*, the National Park Service strives to preserve natural ambient landscapes, which are natural resources and values which exist in the absence of human caused light (NPS 2000). Bark beetle control activities will have no impact on the natural lightscape since all work will occur during daylight hours. This impact topic is dismissed from further consideration.

Historic Structures

The park has 150 buildings listed on the National Register of Historic Places and more under review for eligibility. The park contains seven National Register districts: Utility Area, William Allen White, Deer Haven, Holzwarth Homestead/Never Summer Ranch, McGraw Ranch, Fall River Entrance, and Green Mountain/Onahu. Additionally, the Beaver Meadows Visitor Center is a National Historic Landmark, noted for its outstanding example of mid-20th century Modern design.

Bark beetle management will not affect historic structures because bark beetle control activities will be limited to individual trees or small groups of trees, not the buildings themselves. Trees will only be removed to keep stands healthy and prevent further infestations. No historic buildings would be affected. Therefore, this topic is dismissed from further analysis.

Ethnographic Resources

According to D0-28 and Executive Order 13007 on sacred sites, the National Park Service should try to protect ethnographic resources – any site structure, object, landscape, or natural feature assigned traditional significance in a cultural group traditionally associated with it. Ethnographic resources are not known to exist in the areas proposed for bark beetle management activities. Therefore, this topic has been dismissed from further consideration.

Museum Collections

According to Director's Order 24, the NPS requires the consideration of impacts on museum collections. The park's museum collection is housed in the east side utility area in a location where no bark beetle management activities will occur. These resources are dismissed from further consideration.

Topography and Geology

The topography and geology of Rocky Mountain National Park will not be affected by bark beetle management activities because no earth-moving activities will occur. This topic is dismissed from further consideration.

Socioeconomics

Bark beetle management activities in RMNP would neither change local and regional land use nor appreciably impact local businesses, tourism, and employment. It is unlikely that the minimal use of an insecticide as a last resort will deter park visitors from entering the gateway communities leading into RMNP, thereby not affecting the local economies. Any increase in workforce (i.e., contractors hired to apply the insecticide) would be negligible and last only as long as treatment occurs. Because the impacts to the socioeconomic environment would be negligible, this topic has been dismissed.

Environmental Justice

Executive Order 12898 *General Actions to Address Environmental Justice in Minority Populations and Low- Income Populations* requires all federal agencies to incorporate environmental justice into their missions by addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Because IPM techniques would be executed by park staff regardless of race or income, and contractors would not be hired based on their income, the proposed action would not have disproportionate health or environmental effects on minorities low- income populations or communities. Therefore, environmental justice has been dismissed as an impact topic.

Relationship to Other Plans

This Plan, which proposes using the full range of IPM techniques to manage bark beetles in RMNP, is consistent with the following park documents and other agency plans.

- Master Plan (1976)
- Land Protection Plan (1985/1991)
- Resources Management Plan (1998)
- Backcountry/Wilderness Management Plan (2001)
- Fire Management Plan (1992, updated in 2004)
- Vegetation Restoration Management Plan (1994)
- Wildland-Urban Interface Fuels Management Plan (2002)
- Exotic Plant Management Plan (2003)
- Elk and Vegetation Management Plan (in preparation)
- 2001 National Park Service Management Policies
- **Forest Health and Fuel Reduction Project – Arapaho National Recreation Area (ANRA) EIS**
The USFS plans to improve forest health, reduce fuels contributing to extreme wildfire behavior, and preserve and improve scenic quality by limiting the amount of bark beetle infestation and fuels accumulation. The USFS preferred alternative calls for a variety of treatments in about 2,678 acres of USFS land. Temporary roads and trails would be constructed during implementation that would later be returned to their original character. Proposed treatments include thinning, seed tree cuts, clear cuts, hazardous tree removal, and preventative insecticide spraying of trees in high visitor use areas.

CHAPTER 2 BARK BEETLE MANAGEMENT PLAN

Bark beetle Management Goals

The National Park Service proposes a proactive approach in managing bark beetles in specific areas of the park before they become a serious threat to high-value trees and pose a safety hazard to park visitors and employees. The goals of the Bark beetle Management Plan in RMNP are to:

- Protect high-value trees in developed high-use areas of the park;
- Protect the safety of park visitors and employees;
- Reduce fire risk in identified WUI fuel management areas; and
- Cooperate with adjacent landowners in minimizing risks to high-value trees on private land.

The area considered for bark beetle control represents about 1,000 acres of park land. Of these, 300 acres contain high-value trees in developed areas and identified National Historic districts. RMNP proposes to manage about 88 acres using the full range of IPM techniques. In the 95 percent of RMNP recommended or designated as Wilderness, natural processes prevail and bark beetles will not be managed unless they threaten adjacent private land.

Proposed Strategies

The Plan calls for seven proactive strategies to achieve bark beetle management goals. These include:

- Strategy 1** - Inventory and monitor bark beetle infestations in RMNP.
- Strategy 2** - Prioritize areas for bark beetle control.
- Strategy 3** - Identify and apply control techniques most appropriate for bark beetle species.
- Strategy 4** - Monitor effectiveness of control efforts.
- Strategy 5** - Prevent loss of high-value trees by monitoring bark beetle pathways.
- Strategy 6** - Inform the public about RMNP bark beetle control methods.
- Strategy 7** - Work with adjacent landowners, inholders, and local, county, state and federal agencies.

These strategies, constituting the Bark beetle Management Plan, are detailed below.

Strategy 1 – Inventory and monitor bark beetle infestations in RMNP

Continue the rigorous inventory and monitoring program in RMNP, with emphasis on developed, high-use areas, WUI areas, and areas adjacent to private land. Evaluate and integrate this information into the bark beetle management program.

Inventory and Monitoring

- Park staff and volunteers and USFS entomologists conduct bark beetle surveys each year, and document the size of infestations. The USFS conducts an aerial survey each fall over RMNP and the adjacent Arapaho/Roosevelt National Forest, providing maps where heavy infestations are occurring (Figure 1, p. 2).
- RMNP fire management staff continues to survey WUI fuel management areas and designs treatment strategies in developed, high use areas. The Fire Effects Monitoring Program has established 72 fire effects plots containing beetle-killed trees where trees and other vegetation are monitored.
- RMNP's Vegetation Map, scheduled for completion in 2005, will be updated as needed to account for patches of beetle-killed pine and spruce trees. This map is maintained in the Division of Natural Resources Management.
- RMNP continues to monitor developed high-use areas where beetle-infested trees have been removed. Hazardous tree inventory forms are used to document the number of trees removed

each year. For example, 200 bark beetle-infested or killed trees were removed from Moraine Park Campground during the winter of 2003-2004.

Strategy 2 – Prioritize areas for bark beetle control

Prioritize bark beetle control based on five management criteria within five management zones.

Management Criteria

A . Increased risk of hazardous trees in developed areas

Developed, high-use areas, such as visitor centers, employee housing, campgrounds, picnic areas entrance stations, utility areas, and roadways where people and property are at risk, are high priorities for bark beetle control.

B. Infestations threatening cultural sites and landscapes

Trees contributing to a cultural site or landscape are high priority for bark beetle control. These landscapes include National Register historic districts such as the Holzworth Ranch, William Allen White Cabins, McGraw Ranch, the Utility Area, and the Beaver Meadows Visitor Center National Historic Landmark. Cultural sites include the Grand Lake Cemetery.

C. Threat to private land

Beetle infestations that threaten adjacent properties are high priorities for bark beetle control.

D. Increased risk in fire severity

Bark beetle infestations that increase risk of wildfire danger will be a high priority to control. Dead pine needles and low fuel moisture content increase susceptibility to crown fires. If needles, branches, and trees drop over time, surface fuels increase and can result in hot ground fires. Downed timber can create a nearly impenetrable “jackstraw” effect on the forest floor, increasing safety risks to firefighters and residents in WUI areas. Forest fuels surrounding homes must be managed to reduce that risk. Beetle-killed trees along power lines will also receive priority for control as fallen trees can lead to power outages and increased risk of wildfires.

Management Zones

Five land management zones will also be used to prioritize where bark beetles would be managed:

- A. Natural Zone:** This zone –where natural and ecological processes prevail– comprises undeveloped areas of the park, including 248,464 acres or 93 percent of the park that has been recommended as Wilderness. An additional 2,917 acres is designated as part of the Indian Peaks Wilderness. This zone is a low priority for bark beetle control. No insecticide applications would be used within this zone.

Beetle-infested trees would only be removed as a last resort. Dead trees no longer containing live beetles would remain for wildlife (i.e. cavity nesting birds and habitat for mammals that use cavities) if they are not considered a threat to human life or property. Within recommended wilderness, a minimum tool analysis would be conducted to determine the most appropriate “tool” for removal of infested or dead trees.

- B. Historic Zone.** This zone includes William Allen White (5 structures on less than 3 acres), McGraw Ranch (11 structures on 10 acres), Holzworth Historic District (12 structures on 75 acres), and the Utility Area (81 structures on about 100 acres), Deer Haven (4 structures on 2 acres) National Register districts, the Beaver Meadows Visitor Center National Landmark, and the potentially eligible Lieffer Cabin (1 structure). Protecting high-value trees within historic zones is a high priority.

All trees within a ¼-mile radius of the Historic Zone will be surveyed each year. If beetle infestations are found, chemical treatment may be warranted to protect high-value trees. Those containing live beetles or larva within this zone or buffer area would be removed to minimize risks to non-infested high-value trees. Beetle-killed trees not containing live bark beetles or larva

would be analyzed. If hazardous, they would be removed. Non-hazardous trees would remain for wildlife purposes. A non-hazardous beetle-killed tree no longer containing live larva may be retained and would only be removed only to improve the aesthetic value of the zone.

- C. **Developed Zone.** This zone includes 768 acres of park land where development and intensive use substantially alter the natural environment. Areas include campgrounds, picnic areas, park housing, visitor centers, utility areas, trailheads, and liveries. This zone is managed for administrative and recreation purposes and is disturbed with visitor use and maintenance activities. Protecting high-value trees in developed zones would be a moderate priority.

Trees within a ¼-mile radius of this zone will be surveyed each year. If beetle-infested trees are found, chemical treatment would be warranted to protect uninfested high-value trees. Trees containing live beetles or larva would be removed to minimize risks to uninfested high-value trees. All hazardous trees are a high priority for removal. Non-hazardous trees could remain for wildlife purposes. Removal of non-hazardous beetle-killed trees no longer containing live larva would only be done be removed if it improves the aesthetic values of a Developed Zone.

- D. **Wildland Urban Interface Fuels Management Zone.** This zone includes seven treatment areas comprising approximately 3,670 acres near developments, as defined in the 2002 WUI Fuels Management Plan. There would be a high priority for bark beetle control in WUI areas to reduce fire risk. Thinning maintains a healthy forest, that is better able to withstand beetle outbreaks.

- E. **Road Corridors and Power Line Zone.** This area includes 75 miles of paved roads, 20 miles of unpaved roads, 28.8 miles of above-ground power lines and a number of miles of below-ground power lines. Beetle-killed trees along road corridors can become hazardous, threatening vehicles and human lives. Accordingly, road corridors are surveyed each year and hazardous trees are removed as necessary. Removing hazardous trees within or adjacent to parking areas is a high priority. Removing hazardous trees along road corridors outside of parking areas would be a moderate priority.

Hazardous trees along power lines within the park can be removed by utility companies when conducting routine maintenance, or by NPS employees if identified as an immediate fire risk. The Town of Estes Park and Mountain Parks Electric have approval to remove hazardous trees within rights-of-way granted to both entities. Hazardous trees outside the right-of-way would be removed by NPS personnel. Trees falling across underground power lines are not considered a risk and would not be removed unless the utility company needs to maintain access. Removing hazardous beetle-killed trees along above-ground power lines constitutes a high priority.

Table 1 - Priorities for bark beetle management

Zone	High Priority	Medium Priority	Low Priority
Natural			Removal of beetle-infested trees within 150 feet of the park boundary when notified by an adjacent landowner.
Historic	Removal of hazardous & beetle-infested trees that pose a risk of spreading infestation to high-value trees.		Removal of trees that are not considered hazardous.

Zone	High Priority	Medium Priority	Low Priority
WUI	Removal of beetle-infested trees and beetle-killed trees to reduce fire risk.		
Road & Utility Corridors	Removal of hazardous trees along road corridors and above-ground power lines.		

Strategy 3 – Identify and apply control techniques that are most appropriate for each species.

Control techniques will be selected that achieve maximum effectiveness in protecting high-value trees while minimizing risks to natural resources, cultural resources, and humans.

Several IPM control techniques are available to managers. This plan calls for using individual and/or combined techniques, including:

Mechanical – Using tools such as chainsaws for tree removal to: (1) prevent beetles from infesting other high-value trees; (2) establish healthier forests that can withstand a bark beetle outbreak, and (3) to remove hazardous trees in developed high-use areas of the park. Beetle larva in cut trees can be killed by solarizing the wood by wrapping it in 6-mil clear plastic sealed around the edges with soil, by burning or by chipping.

Sanitation – Cutting and removing individual beetle-infested trees to improve stand health, stop insect spread, and prevent further mortality in the area. This technique must occur before adult beetles fly and spread to other sites. This cost-effective technique has been successful in Timber Creek and Moraine Park campgrounds. Beetle-infested slash associated with this technique must be burned before mature beetles fly. Slash pile burning must follow prescribed fire protocols (1992 Fire Management Plan and 2002 Wildland Urban Interface Fuels Management Plan).

Thinning – Selectively removing trees to increase the vigor of the remaining trees and their ability to withstand bark beetle attacks. The slash from freshly-cut spruce and pine slash trees is subject to beetle attacks. Trees should be cut when they are driest (August through December). Burning must occur before mature beetles fly, usually in June.

Cultural: Watering and Mistletoe control – Watering high-value trees during drought helps reduce stress and increase their ability to repel bark beetles. Another stress-reducing technique is to remove branches that contain mistletoe. Only large mature trees within William Allen White, McGraw Ranch, Holzwarth Ranch, and the Utility Area National Register historic districts may be culturally treated.

Chemicals/Insecticides – Used only as a last resort, insecticides would be applied to repel bark beetles and protect high-value trees in specific locations within the park. Use of insecticides is not intended to kill insects, but to prevent bark beetles from entering trees, thereby protecting them from infestations. After careful evaluation of several preventive chemicals, RMNP proposes the application of Carbyrol XLR because it: 1) is cost effective, 2) lasts up to 2 years, 3) is least toxic to the environment; and 4) is safest for human health.

Spraying would occur in late summer, following peak visitation. Treatment areas would be closed off and re-opened as necessary to ensure visitor safety. The insecticide would be sprayed on the trunk from ground level up to a point where the diameter is of less than 5 inches. It must be applied in advance of a beetle attack to serve as a repellent. Application would be restricted to a small number

of selected high-value trees in developed areas or cultural landscapes due to cost, safety, and accessibility.

By April 30 of each year, NPS staff would identify locations in the park where insecticide applications are warranted. Trail segments, trailheads, picnic areas, parking lots, campsites, and visitor and employee facilities located within or adjacent to planned treatment areas will be posted. Signs would remain in place for 60 days afterwards. All chemical-free campgrounds would be advertised to the public via the RMNP website and other media.

Pheromone Use – Pheromones, message-bearing chemicals emitted by bark beetles, are artificially synthesized and commercially available as lures to attract specific beetles on host trees. Beetles concentrated within the baited trees can be removed or destroyed, while pheromone traps are used to capture flying beetles. Presently there is no effective pheromone to suppress or repel bark beetles in RMNP. If research proves its effectiveness, pheromone use would be evaluated and applied in the future. Pheromones cannot be analyzed in this plan until an effective product is found to control bark beetles in RMNP.

Prescribed Fire – Prescribed fire is a preventive strategy used to meet resource objectives and maintain healthy forests with greater ability to withstand beetle outbreaks. This technique must mimic the integrated role fire played within each ecosystem. Prescribed fire for resource benefit can occur when naturally-ignited wildland fires are allowed to burn under carefully monitored conditions or when fire management staff initiate and monitor the entire event. This strategy is most appropriate in undeveloped areas where motorized access is prohibited.

In some cases, a combination of treatments is necessary to meet bark beetle management goals. For example, sanitation, thinning, and prescribed fire are effective techniques for reducing fire risk and the number of trees killed by bark beetles in WUI areas. Watering, mistletoe removal, and insecticide application are effective in protecting non-infested high-value trees in Developed and Historic zones.

In all cases, the selected control technique(s) must:

- **Pose little or no risk to natural and cultural resources.** RMNP will continue to evaluate treatment options and ensure all environmental and cultural compliance is met. RMNP will review any new relevant scientific literature to ensure control techniques selected are sound.
- **Be cost effective to implement.** While cost is not the driving factor, it must be considered. 2004 estimates reveal that insecticide application by contractors range between \$10 and \$25 per tree. Mechanical techniques cost \$39 per tree.
- **Pose little or no risk to human health and safety.** IPM techniques can harm humans. Injuries can occur with the use of chainsaws, crosscut saws, and prescribed fire. Insecticides can affect human health, particularly those with Multiple Chemical Sensitivity (MCS). RMNP proposes insecticide use only if other control techniques prove ineffective.

RMNP evaluated several insecticides for protecting high-value trees from bark beetles (carbaryl, cyfluthrin, chlorpyrifos and lindane) and determined that carbaryl was the most effective and least toxic to the environment and human health. Carbaryl was found to prevent beetle attacks for up to two years while chlorpyrifos was effective for only about four months (Hall 1982).

Strategy 4 – Monitor effectiveness of control efforts.

Monitoring is essential in evaluating control techniques. RMNP will continue to monitor bark beetle infestations and control techniques, and update the information annually. If mechanical, sanitation, thinning, watering, mistletoe removal, and prescribed fire techniques are adequately protecting high-value trees, insecticides would not be used. Monitoring conducted in 2003 and 2004 indicates that current IPM techniques have not been effective and insecticide application is warranted in specific areas of the park.

RMNP will continue to monitor and report the location of infestations and numbers of trees removed or sprayed with insecticides.

Strategy 5 - Prevent loss of high-value trees by monitoring bark beetle pathways.

Bark beetles outbreaks tend to occur in areas where trees are severely stressed due to drought, wildfire, or large blow downs. These “hot spots” of infestation provide avenues for bark beetles to expand into other areas of the park. Once an epidemic peaks, healthy trees that normally repel beetles are attacked. RMNP will continue to monitor bark beetle outbreaks, especially in Developed and Historic zones.

Another pathway is the ongoing fuel thinning and slash piling operations in WUI areas. Timing of treatments is critical to reduce bark beetle populations inhabiting slash piles and subsequent tree loss. Turpentine from freshly-cut slash attracts beetles into areas where they previously may not have occurred.

To prevent loss of high-value trees, RMNP will employ “Best Management Control and Preventive Practices.” These include:

- Removing beetle-infested trees to protect healthy trees in Developed and Historic zones.
- Solarizing cut trees to kill beetles and larva.
- Thinning infested trees at appropriate times, using prescribed fire and burning slash in WUI areas before beetle larva pupate and fly.
- Using a chemical repellant to protect high-value trees.
- Watering selected trees and removing branches that contain mistletoe in the Historic zone during drought to improve tree health and ability to repel bark beetles.

Strategy 6 – Inform the Public about bark beetle management and control measures.

RMNP has developed a communication plan to inform the public about bark beetle management activities. The plan will:

- Inform the public about local, regional, and national issues regarding bark beetles.
- Inform the public about bark beetle control measures in RMNP, especially insecticide use.
- Inform people with Multiple Chemical Sensitivity (MCS) about upcoming chemical applications.
- Foster communication between the NPS and public on bark beetle management in RMNP.
- Close and post areas of insecticide application, as necessary.

RMNP will inform the public in the following ways:

Programs to Inform the Public	
	<ul style="list-style-type: none">• Visitor Centers – Information on bark beetle management would be available at visitor centers through site bulletins, bulletin board postings, and personal communication by rangers.• RMNP Information Office – Information on insecticide type, location, and application schedules will be available for distribution by April 30 each year. The Information Office will also notify interested parties and the public of prescribed fires used to control bark beetles.• RMNP District Rangers – Information on chemical application schedules, type of chemical and location will be available to District Rangers by April 30 each year.• Interpretive Programs – Beetle management concerns and controls may be integrated into interpretive talks and walks, as appropriate.• Environmental Outreach Programs – RMNP will integrate bark beetle management issues into current environmental education curriculum, as appropriate.• Press releases – The park will notify local media about bark beetle control activities, dates, locations and treatment methods, as necessary.• Park Newspaper – The park newspaper will contain articles and updates about bark beetle management in RMNP.• Mail – Specific information on chemical treatment locations, dates and treatment methods would be mailed to park inholders and adjacent landowners within ¼ mile of a treatment site on, or

about, April 30 each year. The park will develop a mailing list and inform stakeholders on bark beetle management activities at RMNP.

- **Internet** – Updated information about bark beetle control locations, scheduled treatment dates, and treatment methods would be posted on RMNP's web page.
- **Signs** – Insecticide treatment areas will be posted with bright yellow signs, stating the date of application and the chemical used. Signs will be posted two weeks prior to the chemical application date, and would remain in place for 60 days following application.
- **Resource Rendezvous** – The park's resource newsletter will continue to provide bark beetle management information to all employee and external interested parties, as necessary.
- **Yearly Update** – RMNP will provide annual opportunities for interested parties to meet and discuss the effectiveness of management strategies and to explore new techniques.

Strategy 7 – Work with adjacent landowners and local, county, state, and federal agencies.

RMNP will continue to join other federal, state and local government agencies, inholders, and adjacent landowners to achieve common goals for bark beetle management.

The park participates in an informal network of federal, state, county, and city officials and private citizens concerned about bark beetle epidemics. Meetings provide opportunities to develop local and regional strategies and coordinate bark beetle control efforts. RMNP will continue to exchange information with the U.S. Forest Service, Bureau of Land Management, Bureau of Reclamation, United States Geological Survey (USGS), Colorado Department of Agriculture, Boulder County Open Space, and the towns of Estes Park and Grand Lake.

RMNP will continue to work with volunteers in managing bark beetles. Volunteers have helped pile slash in WUI fuel reduction areas and remove beetle-killed hazardous trees from campgrounds in 2003-4. Volunteers contributed more than 1,000 hours to this effort.

CHAPTER 3 ALTERNATIVES

Alternative 1 – NO ACTION

Under the No Action alternative, RMNP would continue to control bark beetle infestations and protect high-value trees using current management practices. These include: mechanical removal, thinning, sanitation, watering, mistletoe removal, and prescribed fire. No synthetic insecticide or pheromone traps would be used. No bark beetle management activities would occur in recommended or designated Wilderness adjacent to private land.

Alternative 1 provides partial protection for high-value trees in Developed and Historic zones. Control work would focus on treating or removing trees within high-use areas and WUI fuel management areas. Moraine Park and Timber Creek campgrounds, utility areas, power lines, Trail Ridge Road, and Grand Lake Cemetery would continue to receive high priority for treatment.

Under this alternative, bark beetle outbreaks would continue to reach epidemic levels on the west side of the park and in developed areas on the east side of the park. Alternative 1 would slow the loss of high-value trees within the park, but not stop it.

Alternative 2 – PREFERRED ALTERNATIVE

The Preferred Alternative provides the broadest range of tools to control beetle-infested trees and offers the greatest long-term protection for high-value trees. The IPM techniques identified in Alternative 1 would be used to prevent loss of high-value trees. Alternative 2 adds the use of an insecticide to prevent tree loss in specific park areas, but only as a last resort if other control techniques are ineffective. Chemical application is not intended to kill insects, but to prevent bark beetles from entering and infesting trees. If research demonstrates the effectiveness of pheromone use, it may be used in place of insecticides in certain situations. When an effective pheromone product is found, it will be analyzed for effects on resources before use.

RMNP proposes the application of the insecticide Carbaryl to treat approximately 400 high-value trees in developed, high use areas in 2005. In 2006, another 400 trees would be treated. All other park areas would remain insecticide-free. Effective for up to two years, this insecticide would be applied every other year by a state-certified contractor on specific trees during an outbreak. Once the outbreak subsides, insecticide use would cease and other IPM techniques would continue as needed.

Under the Preferred Alternative, bark beetles would continue their life cycles naturally in most undeveloped areas (95 percent) of the park. No control techniques would be implemented in recommended or designated Wilderness unless infestations threaten adjacent private lands. In that case, only sanitation and prescribed fire would be used in localized areas.

Only thinning, sanitation, and prescribed fire would be used in WUI areas.

The Preferred Alternative proposes bark beetle control activities in concert with the fuel reduction program to achieve mutual benefits for the park (Wildland-Urban Interface Fuels Management Plan, NPS 2002).

Table 2 identifies the location and strategy for bark beetle control under the Preferred Alternative:

Table 2: Park Location and Bark Beetle Control Strategy - - Alternative 2

Area	Infestation Potential	Control Strategy
Grand Lake Wildland/Urban Interface	High	Sanitation, Thinning, and Prescribed Fire
Timber Creek Campground	High	Sanitation and Insecticide
Holzworth Ranch	Moderate	Sanitation and Insecticide
Deer Haven Historic Site	Moderate	Sanitation and Insecticide
McGraw Ranch	Moderate	Sanitation and Insecticide
Colorado River District – Administrative Area	High	Sanitation and Insecticide
Moraine Park Campground	High	Sanitation and Insecticide
Glacier Basin Campground	Moderate	Sanitation and Insecticide
East Side Utility National Historic District	Moderate	Sanitation and Insecticide
East Side – Wildland/Urban Interface	Moderate	Sanitation, Thinning, and Prescribed Fire
East and West Side – Within recommended wilderness along the park boundary adjacent to private land	Moderate/West side, Low/East side	Sanitation
Other Historic Districts and High-Visitor Use Areas	Moderate	Sanitation and Insecticide

Alternatives Considered and Dismissed

A third alternative was considered to control bark beetles in a larger area of the park. Alternative 3 would expand control techniques beyond developed areas, to power lines, hazard fuel management areas, and isolated areas adjacent to private landowners. Though useful for comparison with other alternatives, Alternative 3 was dismissed for the following reasons:

- Controlling native insects during natural climatic events such as drought in recommended or designated Wilderness (95 percent of park) is not consistent with NPS management policies and would not meet the NPS mandates for preservation of native flora and fauna.
- Periodic bark beetle outbreaks have occurred for thousands of years and play a critical role in the development, senescence, and rebirth of forests within the park.
- Managing bark beetles across the larger landscape is not feasible due to substantial cost and impacts to natural resources.

Mitigation measures

The following mitigation measures have been developed to minimize the degree and/or severity of adverse effects, and would be implemented during beetle control activities, as needed:

Mitigation Measures Common to Alternatives 1 and 2

1. Conduct on-site field surveys prior to treatment to determine the presence and proximity of resources at risk from bark beetle treatments, including aquatic resources, T&E and rare species, and recommended and designated Wilderness..
2. Bark beetle crews will contact the Park Archeologist prior to any work to determine the presence of archeological resources in the area. If resources are identified, work will cease until documentation and cultural compliance is complete.
3. An archeologist will inspect the area before any trees or stumps are to be removed. Removal will cease if archeological materials are found and will not resume until documentation is complete.

4. Park cultural resource specialists will provide written and photographic documentation of all trees located near historic structures and historic districts or cultural landscapes prior to any mechanical treatment or mistletoe removal.
5. Exercise care when dragging logs or tree branches during slash piling operations to minimize impacts to soil and native plant loss. Damaged areas that will not recover within three growing seasons will be revegetated.
6. Work crews involved in the removal of beetle-killed trees shall be trained to recognize trees that are important to wildlife, when to remove hazardous trees, and where to retain trees for wildlife benefit.
7. Avoid wetlands. Keep vehicles out of streams and swales. Do not use vehicles within 100 feet of a stream or in a wetland.
8. Ensure that management techniques do not have an adverse impact on greenback cutthroat trout, Colorado River cutthroat trout, and boreal toad habitat during peak spawning and reproduction periods.
9. Avoid work near birds of prey nests during the breeding season (March through July). Consult with the park's wildlife biologist, GIS Specialist, or Natural Resources Specialist for raptor nest locations.
10. Include job hazard analysis for bark beetle control work. Ensure all employees and volunteers are given proper Personnel Protective Equipment (PPE) and safety instructions for all treatment methods.
11. Flush cut tree stumps. Do not remove stumps from the ground, except for aesthetic reasons in a cultural landscape. Consult with the Park Archeologist before removal. Revegetate affected area following RMNP's "Best Management Practices" (p.19).
12. Maintain or add organic matter or soil inoculate to areas disturbed by mechanical, sanitation, thinning, or pile burning to avoid invasive exotic plant infestations. Burned ground where slash piles existed should be scarified and inoculated with surrounding duff and soil by hand raking. The Moraine Park dump does not need revegetation since further burning will occur, but should be checked for invasive exotic plants.
13. Consult RMNP plant databases to identify rare plant locations. Conduct surveys when plants are flowering or have aerial stems or catkins to determine presence or absence of sensitive species in the project area prior to treatment.
14. Assess beetle-infested trees for removal along the park boundary when private landowners express concern to the superintendent of threats to their land.
15. Remove only the trees that contain live beetles or larva or hazardous trees in Developed and Historic zones, or along the park boundary if threatening adjacent lands. Remove non-hazardous, infested trees only for the purpose of protecting uninfested high-value trees. Leave all other beetle-killed trees for wildlife benefit.
16. Ensure that work crews removing beetle-killed trees are able to identify exotic plants and at least one crew member must be able to identify rare native species.
17. Avoid treatment in sensitive wildlife habitat during lambing, calving, or denning periods, usually occurring between May 1 to mid-June in low elevations and from May 1 to August 31 for high elevation areas. Do not enter closed areas that protect sensitive wildlife.
18. Perform thinning operations in infested areas from August to December and burn slash from January to July, particularly where *Ips* beetles occur. Wood that is infested with live beetles or larva must be burned by the end of June to prevent further infestation.

Mitigation Measures Specific to Alternative 2

1. The threshold warranting the use of an insecticide to protect high-value trees is when one or more beetle-infested trees occurs within ¼ mile of a site to be protected.

2. Follow the Communication Plan (p. 15-16) for insecticide application.
3. Use only water as a carrier for carbaryl.
4. Use the Relative Aquifer Vulnerability Evaluation (RAVE) scoring system to evaluate carbaryl for on-site groundwater contamination potential (Invasive Exotic Plant Management Plan, RMNP, 2003).
5. Insecticide application may not occur between Memorial Day and Labor Day to reduce impacts during peak visitation.
6. When notified by an adjacent landowner of a beetle infestation along the park boundary, the site shall be assessed and trees within 150 feet of the park boundary that contain live beetles or larva shall be removed.
7. Use the "Minimum Requirement Decision Guide," provided by the RMNP Wilderness Coordinator, for bark beetle work along the park boundary in recommended or designated wilderness (Backcountry/Wilderness Management Plan, Rocky Mountain National Park, 2001).
8. Do not spray chemical repellants within 100 feet from the top of a stream bank, lake shore, or aquatic, wetland or riparian habitat. This also applies to roadsides, trails, and utility corridors within 100 feet of stream crossings.
9. Use a spot treatment strategy to spray individual trees. Aerial spraying is not allowed.
10. Reopen sprayed, high use areas no sooner than 12-hours and no later than 24-hours after treatment. In some cases, the actual length of closure could be longer. For example, Loop A in the Moraine Campground would be closed at noon (check-out time) the day of spraying. High-value trees would be treated either that evening or the morning of the next day. If treated the next morning, the loop would not be reopened until the following morning, requiring campsite closure for two nights. If treated the evening of the first day the campsite could be reopen at noon the next day.
11. Notices shall be posted at treatment areas for up to 60 days after chemical application. Posted notices shall include a warning that chemical residues should not be touched.
12. Flag treated trees to prevent people from touching them for up to 60 days.
13. Move or cover picnic tables and cover tent pads beneath trees during spraying. Wash tables and tent pads if drift leaves residues.
14. When an area is targeted for spraying, determine buffer zones where carbaryl would be prohibited. Identify buffer zones with pin flags before spraying begins. Areas to avoid include open water, rare plant and animal habitat, and desired vegetation. The Intermountain Region's IPM Specialist shall be consulted regarding appropriate width of buffer as needed.
15. Select application methods, equipment, and rates that minimize drift and off-target impacts. Use drift reduction techniques.
16. Notify occupants when spraying near homes, offices, or vehicles. Occupants will be advised to keep doors and windows closed and pets indoors during application. Wash areas after spraying if drift leaves residues.
17. All contractors shall be state-licensed commercial applicators. A qualified supervisor must oversee chemical applications, whether conducted by a contractor or NPS personnel.
18. The NPS Pesticide Use Proposal shall be used for all insecticides. Fill out annual Pesticide Use Logs in the NPS approval system.
19. Follow all label instructions, precautions on the MSDS sheets, and additional advice provided by the regional and park IPM Specialists during the NPS Pesticide Approval System review.
20. Monitor weather conditions before and during chemical application. Do not apply when rain appears imminent.
21. Do not apply when wind speeds exceed 5 mph and when wind direction is toward an occupied home, office building, structure, campsite, or picnic tables within 200-feet of treated trees.

22. Do not apply when wind speeds exceed 5 mph and when wind direction is toward aquatic, wetland or riparian habitat within 100 feet of treated trees.
23. Use the application rates specified by the manufacturer unless directed otherwise by a certified applicator or IPM Coordinator.
24. Monitor treated areas to determine effectiveness of carbaryl to repel bark beetles.
25. Do not apply carbaryl in or within 200 yards of known boreal toad or fish habitat.
26. For NPS personnel applying carbaryl:
 - a) Transport only the quantity needed for that day's work;
 - b) Transport concentrate to treatment site in original containers in a manner that will prevent tipping or spilling, and in a compartment that is isolated from food, clothing, and safety equipment.
27. Ensure that park employees and contractors follow manufacturer's instructions for mixing, loading, and disposing chemicals.
28. Ensure that all chemical applicators, (employees and contractors), inspect equipment for leaks or other problems before each application and at intervals during the application day. Test all nozzles, caps or other fittings for seating at intervals throughout the workday. Set aside faulty equipment immediately for repair or replacement.
29. Store carbaryl only in facilities designed and constructed in accordance with provisions of Title 35, Article 10 of the Colorado Pesticide Applicator Act; Part 11 of "Rules and Regulations Pertaining to Administration and Enforcement of the Pesticide Applicator Act." Construct all pesticide storage facilities with adequate sump capacity to contain spillage of the entire quantity of pesticide stored.
30. Dispose all carbaryl containers in accordance with State and Federal requirements. Empty containers thoroughly, rinse them three times, and puncture them to prevent reuse. Recycle containers as per instructions on the product label and MSDS sheets.
31. Ensure all applicators wear protective clothing. NPS will provide PPE for employees. Contractors are responsible for providing PPE to their workers. Applicators must use chemical resistant gloves such as barrier laminate, nitrile rubber beetleer, neoprene rubber beetleer, or viton, shoes and socks, chemical-resistant headgear for overhead exposure, and any other safety clothing and equipment recommended or required by the insecticide label and MSDS sheets. During mixing and loading, eye protection and additional protective clothing (e.g. polypropylene-coated overalls or aprons) may be needed.
32. Carry additional safety equipment, including soap, water clearly labeled as non-drinking water, eyewash kits, first aid equipment, and extra clothing.
33. Provide safety briefings each day prior to carbaryl application.
34. Ensure that MSDS are available at storage facilities, in vehicles, and are readily available to workers.
35. Ensure all chemical applicators are aware of threatened, endangered or rare plants in the area. Rare plant locations shall be flagged using pin flags. Do not apply carbaryl in rare plants locations unless warranted under special circumstances and in a way that will not harm them.
36. Identify locations in the park where carbaryl application is warranted by April 30 each year. Identify all campgrounds in the park that will remain chemical free for that year. Inform the public via the RMNP website and other print media.
37. Prescribed fire shall not be used in any area that has been treated with carbaryl for a period of 6 months following chemical application.

Alternative summaries

Table 3 summarizes the major components of Alternatives 1 and 2 and compares their ability to meet the Bark beetle Management Plan goals. As shown in the following table, Alternative 2 meets each of the objectives identified for this project, while the No Action Alternative does not address all the goals.

Table 3: Alternative Summary and Extent to which Each Alternative Meets Plan Goals

Alternative 1 – No Action	Alternative 2 – Preferred Alternative
Bark beetle management practices would continue, featuring mechanical removal, thinning, sanitation, watering, mistletoe removal, and prescribed fire techniques. No control activities would occur within recommended or designated Wilderness, where high-value trees on adjacent private lands may be threatened.	Bark beetle management practices would continue, featuring mechanical removal, thinning, sanitation, watering, mistletoe removal, and prescribed fire control techniques. In addition, the insecticide Sevin brand XLR carbaryl would be applied to prevent spread of infestations and protect high-value trees. The park would work with adjacent landowners to reduce the threat of beetle infestations on their land. Pheromone use will be included in bark beetle management if proven effective in controlling infestations during the life of this plan.
Meets Plan Goals?	Meets Plan Goals?
No. Current practices are not effective in stopping the spread of bark beetle infestations. High-value trees continue to be at risk of significant loss in developed, high use areas of the park, such as campgrounds, picnic areas, housing areas, and identified cultural landscapes where high-value trees are an integral component of the landscape. The number of hazardous trees due to beetle infestations would increase, placing park visitors and property at greater risk. RMNP would reduce the buildup of hazard fuels and spread of infestations by removing beetle-infested trees and beetle-killed trees in Wildland-Urban Interface Hazard Fuel Management areas. Control work would be limited to localized areas within the park without consideration to adjacent landowners where infestations might spread from park boundaries to private lands.	Yes. This proactive approach would increase the effectiveness of current control measures. With the additional technique of insecticide application, Sevin XLR Carbaryl, the park would control the loss of high-value trees in Developed and Historic zones. Beetle-infested or killed trees would be removed to prevent further outbreaks and to protect the safety of park visitors and employees. RMNP would reduce the buildup of hazard fuels and spread of infestations by removing beetle-infested trees and beetle-killed trees in Wildland-Urban Interface Hazard Fuel Management areas. Park management would control bark beetles in recommended Wilderness within 150 feet of the park boundary if adjacent landowners request protection from infestations. This alternative enables the park to work with adjacent landowners in protecting high-value trees near park boundaries, in compliance with NPS and RMNP policies.

Table 4 summarizes the anticipated environmental impacts for of Alternative 1 and 2. Only those impact topics that have been carried forward for further analysis are included: The *Environmental Consequences* chapter provides a detailed explanation of these impacts.

Table 4: Comparative Summary of Environmental Impacts on Alternatives 1 and 2

Topic	Alternative 1 – No Action	Alternative 2 – Preferred Alternative
Soils and Vegetation	High-value trees may continue to be lost in significant numbers, resulting in a moderate long-term adverse impact . There would be negligible to minor impacts to soil and native vegetation in most areas of the park. The fire risk due to bark beetles in WUI areas are addressed in the 2002 WUI Fuels Management Plan. There would be a long-term minor to moderate adverse impact to high-value trees on private land adjacent to the park.	Provides greatest long-term beneficial effects to high-value trees. This alternative offers the greatest protection to high-value trees in developed areas. Impacts to areas within WUI fuel management areas would be the same as Alternative 1. There would be a short-term localized minor impact during insecticide application. There would be a short-term localized minor impact in recommended Wilderness along the park boundary. The risk to high-value trees on private land adjacent to the park would be reduced.
Natural Soundscape	There would be a minor to moderate short-term impact on the natural soundscape from chainsaw use and crews conducting thinning, sanitation, and prescribed fire operations during treatments.	Impacts would be the same as Alternative 1 in WUI and developed areas of the park. There would be short-term localized moderate impacts in recommended Wilderness along the park boundary, while work occurs.
Aquatic, Wetland and Riparian Communities	Bark beetle management activities will not occur in aquatic, wetland and riparian communities, so no adverse impacts are anticipated.	Insecticide use could cause short-term negligible to minor adverse impacts if insecticides enter open water through runoff and spills. Mitigating measures and the RAVE scorecard will minimize adverse impacts.
Endangered, Threatened and Rare Species	There could be short-term negligible impacts to the Northern goshawk and Canada lynx and a minor adverse impact on rare plants and insects if encountered in project areas. Prescribed fire would result in a short-term minor impact , but a long-term minor benefit to T&E or rare species.	Impacts would be the same as Alternative 1. There could be a short-term minor impact to lynx if mechanical and sanitation techniques occur in recommended wilderness.
Wildlife	Wildlife may be temporarily displaced from habitat, resulting in localized short-term, negligible to minor impacts . Beetle-infested/killed trees provide food and shelter for some birds and small mammals, resulting in minor beneficial impacts to some wildlife.	Impacts would be the same as Alternative 1, except that carbaryl use could result in a long-term localized minor adverse impact on wildlife that use chemically treated trees or flowering plants.

Topic	Alternative 1 – No Action	Alternative 2 – Preferred Alternative
Wilderness	There would be an indirect negligible to minor adverse impact to wilderness through control work conducted adjacent to recommended Wilderness. Temporary displacement of wildlife and noise due to control work nearby can adversely affect wilderness values.	Impacts would be the same as Alternative 1 for bark beetle management outside wilderness. There would be localized short-term minor to moderate adverse impacts if infested trees are removed from recommended Wilderness adjacent to private land. Mitigation measures will reduce consequences to a short-term localized minor impact .
Air Quality	There would be a localized negligible adverse impact on air quality in areas where chainsaws or prescribed fires are used.	Impacts would be the same as Alternative 1. Using an insecticide could have short-term minor impacts on air quality, principally from drift. Mitigating measures will reduce adverse effects.
Cultural Resources: Archeological resources and cultural landscapes	There would be a long-term minor to moderate impact to cultural landscapes due to the continued risk of losing high-value trees. There are no known archeological resources in project areas, however, sites will be surveyed and mitigation measures implemented to ensure their protection.	There would be a minor long-term beneficial impact to cultural landscapes due to greater protection of high value trees by carbaryl use. There are no known archeological resources in project areas, however, sites will be surveyed and mitigation measures implemented to ensure their protection.
Visitor Experience	There would be a localized short-term minor to moderate impact due to the presence of work crews and noise during tree removal and control activities. Continued loss of high-value trees that provide shade and screening in campgrounds and picnic areas may occur. No roads, trails or campgrounds would be closed. Some picnic areas and campsites may be closed briefly during tree removal.	The impacts would be the same as Alternative 1, except that additional short term minor to moderate adverse impacts would occur from temporary closures of chemically-treated campgrounds and picnic areas. While this may cause short-term minor inconveniences, there would be a long-term minor beneficial impact resulting from protecting high-value trees in high-use recreation areas.

Topic	Alternative 1 – No Action	Alternative 2 – Preferred Alternative
Human Health and Safety	There could be direct short – term adverse effects on human health and safety resulting from accidents, insect stings, smoke, and flying debris from implementing the various mechanical, cultural, and prescribed fire techniques to treat beetle-infested trees.	The impacts would be the same as Alternative 1, except that additional short term direct and indirect minor to moderate adverse impacts would occur from insecticide application. Strictly-implemented mitigation measures would minimize human risk from dermal, respiratory, or dietary exposure to insecticides (See pp. 48-50 for details.)
Park Operations	There would be a moderate direct short term (0-5 years) beneficial impact resulting from increased staff, funds, and resources needed to control beetles if infestations continue to spread at the current rate. There would be a minor long-term (5-10 years) adverse effect on park operations once the bark beetle cycles subside.	Using an insecticide will provide increased protection of high value trees and reduce safety risks associated with hazardous trees. Consequently less time, money, and personnel would be devoted to bark beetle control, resulting in a minor to moderate long-term beneficial effect on park operations.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

Alternative 2 is the environmentally preferred alternative. The environmentally preferred alternative is determined by applying criteria suggested in the National Environmental Policy Act of 1969 (NEPA), with additional guidance provided by the Council of Environmental Quality (CEQ). The environmentally preferred alternative is the one “that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural and natural resources.” As expressed in section 101 of NEPA, “it is the continuing responsibility of the Federal Government to:

- Fulfill the responsibility of each generation as trustee of the environment for succeeding generations;
- Assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
- Preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life’s amenities; and
- Enhance the quality of renewable natural resources and approach the maximum attainable recycling of depletable resources.”

Alternative 2 is the environmentally preferred alternative because using the full range of IPM techniques, including insecticide application, is the most effective way to reduce the number of beetle-infested/killed trees throughout the park. It also offers the greatest long-term protection for high-value trees in developed areas where screening for privacy and shade in campgrounds, picnic areas, and housing areas is desirable and in National Register historic districts where large mature trees are an integral part of the cultural landscape. Consequently, fewer hazardous trees would require removal, which meets all of

the environmental policy goals. Control techniques would be localized to areas where bark beetles are found. Insecticide use would be allowed in Developed and Historic zones to ensure high-value tree protection.

Alternative 1, the No Action Alternative, which restricts control techniques to thinning, sanitation, watering, mistletoe removal, and prescribed fire is not totally effective at preventing loss of high-value trees during the peak of a bark beetle outbreak. There would also be a greater risk of hazardous trees. To fully meet environmental policy goals, an insecticide would have to be used as a repellent “without degradation, risk of health or safety, or other undesirable and unintended consequences.”

SUMMARY

In compliance with NPS and RMNP policies, the Preferred Alternative would control the loss of high-value trees in developed areas and in cultural landscapes. Beetle-infested or killed trees would be removed to prevent further outbreaks and to protect the safety of park visitors and employees. RMNP would reduce the buildup of hazard fuels and spread of infestations by removing beetle-infested trees and beetle-killed trees in Wildland-Urban Interface Hazard Fuel Management areas.

Additionally, the park would work with private landowners to control infestations from spreading to adjacent lands. Trees may be removed in localized areas along the park boundary in recommended Wilderness upon request by adjacent landowners. Only beetle-infested trees within 150 feet of the park boundary would be considered for removal. Insecticides would not be used in Wilderness or in WUI areas outside developed areas. Human health is a concern in high-use areas of the park where an insecticide could be used.

CHAPTER 5 ENVIRONMENTAL CONSEQUENCES

Methodology

The proposed Integrated Pest Management (IPM) techniques of both alternatives are evaluated on their effectiveness in managing bark beetles while minimizing risks to natural resources, cultural resources, and the human environment. The alternatives have been evaluated for their effects on the resources and values determined during the scoping process. For each topic, impacts are identified in terms of context (effects are site-specific, local, or regional), intensity (negligible, minor, moderate, or major), and duration (short- or long-term). Definitions for intensity levels varied by topic, but for all impact topics, the following definitions were applied:

Impacts may be beneficial, adverse, direct, indirect, or cumulative:

Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse: A change that moves the resource away from a desired condition or detracts from its desired condition.

Direct: An impact caused by an action, occurring at the same time and place as the action.

Indirect: An effect caused by the action that occurs later in time or farther removed from the place.

Cumulative: An “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future action regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). Cumulative impacts can result from individually minor, but collectively significant actions taking place over time. The Council on Environmental Quality (CEQ) regulations, that implements the National Environmental Policy Act, requires assessment of cumulative impacts in the decision making process for federal projects.

Impairment of Park Resources and Values

In addition to determining the environmental consequences of the No Action and Preferred alternatives, NPS policy requires analysis of potential effects to determine whether actions would impair park resources (Management Policies 2001).

The fundamental purpose of the national park system, established by the Organic Act, is preservation and park managers must seek ways to avoid or minimize adverse impacts on park resources and values. However, the laws provide for management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values or a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the enabling legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park; or
- Identified as a goal in the park’s general management plan or other relevant NPS planning documents.

SOILS AND VEGETATION

Intensity Level Definitions

Determination of the intensity of impacts to soils and native vegetation was derived from available soils and vegetation information (NRCS and park files) and park staff observation of the effects on soils and vegetation from bark beetle management activities. The thresholds of change for the intensity of impacts to soils and vegetation are defined as follows:

- Negligible:** The impact is at the lowest level of detection and causes very little or no physical disturbance/removal, compaction, and unnatural erosion, when compared with current conditions.
- Minor:** The impact is slight, but detectable in some areas, with few perceptible effects of physical disturbance/removal, compaction or unnatural erosion.
- Moderate:** The impact is readily apparent in some areas and has measurable effects of physical disturbance/removal, compaction or unnatural erosion.
- Major:** The impact is readily apparent in several areas and has severe effects of physical disturbance/removal, compaction, or unnatural erosion.

Effects of Alternative 1 - No Action

Removing beetle-infested/killed trees would have minor impacts to soil in developed areas of the park, where soil is already compacted. Minor soil compaction and erosion and native plant loss is expected where trees are cut and removed, but effects would be short-term with full recovery expected.

Thinning, piling slash and removal, and sanitation techniques would have negligible to minor short-term localized, direct adverse effects on soils and vegetation. Sanitation would have a minor, beneficial short-term localized impact in helping to reduce local beetle populations and prevent further mortality of uninfested high-value trees in the area. Accessing work sites and dragging downed timber disturbs and compacts local soil and vegetation, creating a negligible to minor impact. These effects would be short-term with full recovery expected.

Watering and mistletoe removal is expected to have a minor beneficial impact on soils and high-value trees around visitor centers and housing areas. Watering can increase the ability of trees to withstand bark beetle attacks, benefiting herbaceous plants that grow around their bases.

Low-intensity, prescribed fire would have minor local beneficial impacts on soil fertility. This would occur directly as minerals and nutrients are released during combustion, and indirectly by increasing decomposition rates. Prescribed fire would establish healthier forests, better able to withstand bark beetle outbreaks. Vegetation would experience minor short-term adverse impacts from prescribed fire but would create a minor to moderate long-term beneficial effect as prescribed fire can mimic an ecological process in a fire-adapted community.

Bark beetle management activities would benefit high-value trees on adjacent private lands if infestations can be kept from spreading beyond park boundaries. Loss of numerous high-value trees would be expected to continue, as IPM techniques available in the No Action Alternative would slow, but not stop mortality.

Cumulative Effects: Most bark beetle management activities occur in developed areas already altered by human presence predating park establishment through today. Some occur in, or overlap with, areas

currently being managed for WUI fuel reduction and invasive exotic plant management control. Fuels and hazardous tree management activities are presently removing trees, including high-value trees killed by bark beetles in proposed bark beetle treatment areas. These practices are expected to continue. Cumulative impacts from fuel treatment and exotic plant management are addressed in recent management plans/EA's (NPS, 2002, 2003)

Cumulatively, Alternative 1 would result in a minor to moderate adverse impact on native vegetation and a minor adverse impact on localized soils where mechanical removal, thinning, and sanitation techniques are expected to continue in controlling infestations and where fuel reduction and invasive plant management are ongoing.

Conclusion: Alternative 1 would have a minor to moderate cumulative impact on soils and native vegetation in specific areas of the park due to mechanical, thinning, sanitation and prescribed fire control techniques. These cumulative effects would be ameliorated over time as the bark beetle outbreaks subside and control is eventually discontinued. Alternative 1 may not be effective at protecting high-value trees. If bark beetles continue to infest high-value trees in developed areas of the park, there could be a moderate cumulative long-term adverse impact due to eventual mortality of ponderosa and lodgepole pine trees and a minor adverse impact to soil erosion.

Because there would be no major, adverse impacts to soils or native vegetation whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 1 is selected.

Effects of Alternative 2 - Preferred Alternative

The environmental consequences of using mechanical, thinning, sanitation, watering, mistletoe removal, and prescribed fire techniques would be the same as Alternative 1 with the exception that occasional mechanical and sanitation techniques would be used in recommended Wilderness adjacent to private land, resulting in a minor benefit to park neighbors and a minor adverse impact to soils and vegetation.

Insecticides would not be used in recommended or designated Wilderness, about 95 percent the park. Chemical use would have a minor localized short-term adverse impact to soils and native vegetation in Developed and Historic zones where applied. A two percent solution of carbaryl, applied in late summer and lasting up to 2 years with 100 percent effectiveness would have a moderate benefit to treated high-value trees. Spraying from the back of a truck or ATV may necessitate driving off-road into frontcountry areas, causing short-term localized minor impact on soils and native plants.

Contact with non-target plants may injure some plants. Small amounts of carbaryl are absorbed by roots and leaves. Aerial spraying is prohibited. Mitigating measures would reduce potential impacts to non-target plants.

Cumulative Effects: Fuels and hazardous tree management activities are presently removing trees, including high-value trees killed by bark beetles, in proposed bark beetle treatment areas. These practices are expected to continue. Cumulative impacts from fuel treatment and exotic plant management are addressed in management plans/EA's (NPS, 2002, 2003).

The proposed use of carbaryl may overlap with areas receiving herbicide treatments, in accordance with the Invasive Exotic Plant Management Plan (NPS, 2003). Using herbicides and an insecticide in the same area may have a short-term minor impact on soil microbes and on vegetation at the base of trees and nearby.

Conclusion: Use of an insecticide, with other IPM techniques, will better protect high-value trees by increasing their ability to withstand bark beetle attacks. Additionally, it would reduce safety hazards associated with weakened, hazardous trees. Minor adverse cumulative impacts would eventually be

ameliorated. Protecting large high-value trees and native plant biodiversity would result in a minor long-term beneficial effect.

Because there would be no major, adverse impacts to soils or native vegetation whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 2 is selected.

NATURAL SOUNDSCAPE

Intensity Level Definitions

Analyses of the potential intensity of impacts were derived from park staff's observations of the effects on the natural soundscape from ongoing bark beetle control activities. The thresholds of change for the intensity of impacts to the natural soundscape are defined as follows:

- Negligible:** The impact is at the lowest level of detection and causes very little or no physical disturbance when compared with current conditions.
- Minor:** The impact is slight, but detectable in some areas, with few perceptible effects of physical disturbance.
- Moderate:** The impact is readily apparent in some areas and has measurable effects of physical disturbance.
- Major:** The impact is readily apparent over a larger area and has severe effects of physical disturbance.

Effects of Alternative 1 - No Action

There would be moderate short-term localized noise impacts from chainsaw use in WUI fuel management areas and developed areas of the park. There would be no bark beetle management in recommended Wilderness.

Thinning, sanitation, piling slash and removal, and removing mistletoe branches would have moderate short-term localized, direct adverse effects to the natural soundscape due to the presence of work crews, equipment use, and activities associated with mechanical cutting and removal of trees.

Sanitation to remove beetle-infested trees would have a moderate short-term localized, direct adverse effect on the natural soundscape.

Low-intensity, prescribed fire, if used to control bark beetles, would have a minor, local, adverse impact on natural sounds within the park.

Cumulative Effects: Most of the proposed bark beetle management activities occur in developed areas (campgrounds, visitor centers, along roadsides) already altered by human presence, park visitation, and human-caused noise. Some beetle control activities would occur in the Utility Area, where human noise and vehicle/machinery use are an ongoing part of daily park operations. Other bark beetle activities occur in, or overlap with areas currently being managed for WUI fuel reduction. Fuels and hazardous tree management activities are presently removing trees, including high-value trees killed by bark beetles in proposed bark management areas. These practices are expected to continue. Cumulatively, impacts will have a short-term direct moderate, localized adverse impact on the natural soundscape.

Conclusion: Alternative 1 would have a direct short-term localized minor to moderate impact on the natural soundscape in specific areas from mechanical removal, thinning, sanitation, and prescribed fire. The effects on the natural soundscape would last only during the proposed work and would be ameliorated over time as outbreaks subside, alleviating the need for control measures altogether.

Because there would be no major, adverse impacts to the natural soundscape whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 1 is selected.

Effects of Alternative 2 - Preferred Alternative

The environmental consequences of using mechanical, cultural, thinning, sanitation and prescribed fire management techniques are the same as Alternative 1 with the exception that there would be short-term moderate adverse impacts to soundscape in recommended Wilderness if beetle-infested trees are removed to protect adjacent private land.

Negligible to minor short-term localized impacts would occur as using an ATV or truck to apply insecticides creates noise. There would be no aerial application of carbaryl, so noise impacts from a helicopter or fixed winged aircraft would not occur.

Cumulative Effects: Most of the proposed bark beetle management activities occur in developed areas (campgrounds, visitor centers, utility areas, and along roadsides) where park employees work, visitors recreate, and noise is ongoing. Some bark beetle management activities would overlap with areas currently being managed for WUI fuel reduction. These practices are expected to continue. ATV or truck use associated with spraying an insecticide on high-value trees would result in minor direct short term adverse impacts. Cumulatively, impacts will have a minor to moderate, localized direct adverse effects to the natural soundscape while work is ongoing.

Conclusion: Alternative 2 would have a minor to moderate short-term impact during control activities only, but high-value trees would be better protected. It is anticipated that many high-value trees could survive a bark beetle outbreak as the full range of IPM techniques are implemented, resulting in the amelioration of cumulative impacts. Impacts in recommended Wilderness would be ameliorated over time as the outbreak subsides and controls are no longer necessary.

Because there would be no major, adverse impacts to the natural soundscape whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 2 is selected.

AQUATIC, WETLAND, AND RIPAIAN COMMUNITIES

Intensity Level Definitions

Analyses of the potential intensity of impacts were derived from research conducted in the park, park files, scientific literature, and park staff's observations of the effects on aquatic, wetland and riparian communities from bark beetle management activities. The thresholds of change for the intensity of impacts to aquatic, wetland and riparian communities are defined as follows:

Negligible: The impact is at the lowest level of detection and causes very little or no physical disturbance when compared with current conditions.

Minor: The impact is slight, but could be detectable in some areas, with few perceptible effects.

Moderate: The impact is readily apparent in some areas and has measurable effects.

Major: The impact is readily apparent in several areas and has severe effects.

Effects of Alternative 1 - No Action

Bark beetle management activities will not occur within aquatic, wetland and riparian communities so no impacts are expected. If a large tree was removed from an upland area adjacent to a wetland or riparian area, soil erosion could increase and have a negligible short-term impact on riparian communities and water quality. Native wetland and riparian vegetation would be expected to fully recover.

Watering high-value trees and mistletoe removal would have no impact on aquatic, wetland or riparian communities, as efforts would be directed in upland habitat, removed from sensitive aquatic resources.

Prescribed fire is currently suspended on willow and aspen found throughout RMNP's riparian areas, so no impacts are expected to occur from this activity.

Cumulative Effects: Visitor use and atmospheric deposition has altered water quality. Previous impacts in wetland and riparian communities have resulted from early settlement and park infrastructure development. Cumulatively, there would be negligible impacts to wetlands and riparian communities as bark beetle management activities will avoid these sensitive areas.

Conclusion: Alternative 1 could result in negligible impacts to wetland and riparian vegetation from mechanical, sanitation, and thinning techniques occurring in adjacent upland habitat. No motorized vehicles would be allowed in wetland and riparian communities. It is anticipated that Alternative 1 would not be highly effective in protecting high-value trees near aquatic, wetland or riparian habitat. As more high-value trees are lost, additional mechanical controls would be needed, creating the potential for increased cumulative impacts to wetland and riparian vegetation.

Because there would be no major, adverse impacts to aquatic, wetland or riparian communities whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 1 is selected.

Effects of Alternative 2 - Preferred Alternative

The environmental consequences of using mechanical, watering, mistletoe removal, thinning, sanitation, and prescribed fire techniques would be the same as Alternative 1 with the exception that occasional mechanical and sanitation techniques may be used in recommended Wilderness to protect adjacent private land. No trees would be removed from aquatic, wetland or riparian areas in recommended Wilderness.

Carbaryl would not be applied within aquatic, wetland or riparian habitat, reducing potential impacts to these sensitive resources and groundwater. The use of carbaryl near water, however, could result in negligible to minor short-term adverse impacts to aquatic, wetland and riparian communities as the insecticide has the potential to enter open water through runoff and spills. When mixed with water and applied to high-value trees, carbaryl is unlikely to contaminate surface water except when heavy rainfall occurs soon after application.

Leaching, root uptake, and movement in soil and groundwater govern the effects of carbaryl. The solubility of carbaryl in water (~ 40 ppm) and the potential for leaching is low. In water, carbaryl is broken down chemically by sunlight and microorganisms. Carbaryl does not persist in aquatic environments and has a low leachability in soils (USDA 1992, Infoventures 2004, Hastings et al. 2001), resulting in a negligible short-term impact.

Carbaryl is moderately toxic to fish and moderately toxic to highly toxic to aquatic invertebrate animals. It builds up in fish at low rates, but is unlikely to affect them since no control activities are proposed in

aquatic habitat. The park will use an aquifer vulnerability scoring system – Relative Aquifer Vulnerability Evaluation (RAVE) – to identify areas near wetlands unsuitable for insecticide application (NPS, 2003). Those areas would not be sprayed.

Insecticide use in RMNP will be based on published research and current scientific data. It will follow the NPS-Pesticide Use Proposal System, which requires review and approval by the Intermountain Region IPM Specialist before work begins.

Cumulative Effects: Insecticide use would result in minor cumulative impacts to wetland and riparian vegetation in specific areas of the park where herbicide use is, or will be, occurring, in accordance with the approved 2003 Invasive Exotic Plant Management Plan. It is anticipated that with insecticide use high-value trees would be better protected, ultimately reducing cumulative impacts.

Conclusion: Alternative 2 would result in minor cumulative impacts to wetland and riparian vegetation in specific areas of the park due to insecticide use and the implementation of the 2003 Invasive Exotic Plant Management Plan that approved the use of herbicides. It is anticipated that high-value trees would be better protected, ultimately reducing cumulative impacts.

Because there would be no major, adverse impacts to aquatic, wetland or riparian communities whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 2 is selected.

ENDANGERED, THREATENED, AND RARE SPECIES

Intensity Level Definitions

Analyses of the potential intensity of impacts were derived from available information on endangered, threatened and rare species. Map locations of sensitive resources were compared with ongoing and proposed bark beetle management activities. Predictions about short-term and long-term site impacts were based on existing inventory and monitoring data from RMNP. The thresholds of change for the intensity of impacts to endangered, threatened and rare species are defined as follows:

- Negligible:** The impact could result in a change to a population or individuals of a species or resource but the change would be so small that it would not be of any measurable or perceptible consequence.
- Minor:** An action that could result in a change to a population or individuals of a species or a resource. The change would be small and localized and of little consequence.
- Moderate:** An action that would result in some change to a population or individuals of a species or resource. The change would be measurable and of consequence to the species or resource but more localized.
- Major:** An action that would have a noticeable change to a population or individuals of a species or resource. The change would be measurable and result in a severely adverse or major beneficial impact, with possible permanent consequences for the species or resource.

Effects of Alternative 1 - No Action Alternative

No threatened or endangered plant and insect species are known to occur in areas proposed for bark beetle control work, so no impacts from thinning, piling slash and removal, and sanitation activities are expected. Treatment areas will be examined to determine the presence and proximity of threatened, endangered, and candidate species before treatment begins, and work would be adjusted away from sensitive species which would mitigate potential adverse impacts.

Watering high-value trees in developed high-use areas of the park or removing mistletoe would have no impact on endangered, threatened or rare species.

Minor soil erosion and native plant loss may occur around beetle-killed trees when removed. Removing large numbers of trees could have a minor affect on rare plants, but flagging would be used to identify their locations and control work would be adjusted to protect them from adverse impacts. Native vegetation is expected to fully recover after control work subsides.

The No Action Alternative prohibits work in recommended or designated Wilderness where the potential for threatened or endangered species occur. No work is proposed near known breeding locations of endangered, threatened or rare wildlife species. There are no eagle nests near proposed treatment areas.

Removing beetle-infested or killed trees could have a minor short-term direct adverse impact on the Northern goshawk, state listed as vulnerable during its breeding season. Goshawks forage and hunt in forested areas and near developed areas where control treatments are proposed. Temporary displacement could occur, however, there are no known nests in proposed treatment areas.

There is no relic population of the federal and state-listed lynx, but four radio-collared lynx have been sighted in and near RMNP since their release in southwestern Colorado in 1999. Under the No Action Alternative, beetle control activities would occur in developed areas, removed from potential lynx habitat in the park. No adverse impacts to the Canada lynx are anticipated.

Cumulative Effects: Ongoing fuel reduction and hazardous tree removal, coupled with bark beetle management activities could result in temporary displacement of wildlife, causing negligible direct short-term impact to threatened or endangered or rare species. Animals are expected to return when work subsides, alleviating cumulative impacts.

Prescribed fire, used in fuel reduction (in WUI areas) and exotic plant management, may be extended to control beetle infestations. All prescribed fire areas in the park are inventoried for threatened, endangered, and candidate species before burning occurs, resulting in no impacts to endangered, threatened and rare species in the park.

Conclusion: Alternative 1 could have negligible to minor impacts to endangered, threatened and rare species, such as the Northern goshawk and Canada lynx. Areas would be surveyed for these species before control techniques are implemented and work would be limited to developed areas and WUI areas of the park. Alternative 1, however, has not been effective at protecting high-value trees. To control beetles, additional mechanical and sanitation techniques would be required, with the potential to create impacts to endangered, threatened or rare species. Under Alternative 1, beetle management activities would not occur in recommended or designated Wilderness, increasing protection for endangered, threatened and rare species.

Because there would be no major, adverse impacts to endangered, threatened or rare species whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 1 is selected.

Effects of Alternative 2 – Preferred Alternative

Using carbaryl is potentially hazardous to endangered, threatened, candidate and rare species. Most endangered, threatened and rare species occur in recommended or designated Wilderness where carbaryl would not be used, so adverse impacts are not anticipated.

Carbaryl will not be sprayed in or near boreal toad or native Greenback cutthroat trout or Colorado River cutthroat trout habitat. It would not be used in or near known bald eagle nesting sites or potential lynx habitat, resulting in no impact to these endangered, threatened or candidate species.

Though carbaryl has the potential to enter systems and bioaccumulate in wildlife (Cox 1993), the amount proposed for use is considered low-risk with no bioaccumulation threat (Hasting et al. 2001). Mitigation measures would further reduce the risk. Carbaryl is moderately toxic to fish and moderately to highly toxic in aquatic invertebrate animals. It can build up in fish at low rates and impact wildlife, such as bald eagles and ospreys that feed on them. Mitigation measures will be followed so carbaryl does not enter aquatic environments.

Long-term persistence of carbaryl in the food chain, and subsequent toxic effects are not expected to occur in RMNP, due to the rate and quantities proposed for application. Carbaryl does not contain organo-chlorines that can cause egg-shell thinning and other harmful effects to wildlife (Infoventures 2004).

Though no known rare plants occur near proposed treatment sites (DBG 2000), every area would be surveyed for endangered, threatened or rare species before treatment occurs. If rare plants are found, further review would be required prior to chemical use. If federally listed or candidate species are involved, RMNP would consult with the U.S. Fish and Wildlife Service (FWS).

Contamination of rare plant species due to runoff or drift is unlikely except when heavy rainfall occurs soon after application. Consequently, carbaryl would not be applied when rainfall is imminent or winds exceed 5 mph. Carbaryl would have no impact to federally listed species occurring downstream of RMNP.

Sevin® brand XLR PLUS carbaryl is less hazardous to insects than other brands when direct application to insects is avoided and the spray residues have dried. To reduce impacts to rare insects and butterflies, carbaryl would be applied in the late evening or early morning when they are less likely to forage. Spraying would avoid concentrations of flowering plants.

Implementing mitigation measures would reduce the risk of affecting T&E species and rare plants and insects with chemical control to a minor short-term adverse impact.

Cumulative Effects: Fuel reduction and herbicide use are ongoing activities that occur in areas proposed for bark beetle management. Together, these controls pose a negligible, minor short-term impact to T&E and rare flora and fauna in RMNP. The long-term impact is beneficial as forest health is maintained and the need for control activities subsides. Beetle management activities would indirectly affect private landowners if infestations within the park spread to their lands.

Conclusion: The environmental consequences of using mechanical, cultural, thinning, sanitation and prescribed fire techniques are the same as Alternative 1 with the exception that mechanical and sanitation techniques may be used in recommended Wilderness adjacent to private land, increasing the potential effect on endangered, threatened or rare species, including lynx. Presently, no lynx are known to reside in the park. Occasional work along the park boundary is not expected to alter lynx habitat.

The occasional removal of an infested tree or small cluster of trees along the park boundary adjacent to private land would have negligible to minor impacts due to temporary displacement of endangered, threatened, or rare wildlife such as the state-listed Northern goshawk. Treatments will not occur in boreal toad, native trout, or bald eagle habitats. Areas recommended for treatment in wilderness would be surveyed for endangered, threatened or rare species before work begins.

Being proactive in protecting high-value trees by using an insecticide would reduce the amount of chemical repellent and other techniques needed to protect trees in the long run. Carbaryl would only be used at the peak of an outbreak when high-value trees are at greatest risk. Once the risk subsides, insecticide use would be discontinued, reducing risks to T & E and rare plants and animals.

Because there would be no major, adverse impacts to endangered, threatened or rare species whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 2 is selected.

WILDLIFE

Intensity Level Definitions

Analyses of the potential intensity of impacts were derived from all available information on wildlife. Map locations of sensitive resources were compared with proposed bark beetles management activities. Predictions about short- and long-term site impacts were based on existing inventory and monitoring data from RMNP. The thresholds of change for the intensity of impacts to wildlife are defined as follows:

- Negligible:** The impact could result in a change to a population or individuals of a species or resource but the change would be so small that it would not be of any measurable or perceptible consequence.
- Minor:** The action could result in a change to a population or individuals of a species or a resource. The change would be small and localized and of little consequence.
- Moderate:** The action would result in some change to a population or individuals of a species or resource. The change would be measurable and of consequence to the species or resource but more localized.
- Major:** An action that would have a noticeable change to a population or individuals of a species or resource. The change would be measurable and result in a severely adverse or major beneficial impact, with possible permanent consequences for the species or resource.

Effects of Alternative 1 - No Action Alternative

Removing bark beetle-infested trees or dead hazardous trees would have negligible to minor localized adverse impacts to wildlife due to temporary displacement of animals during mechanical treatments. Wildlife is expected to return when these activities cease.

Tree removal, however, can eliminate important habitat for cavity nesting birds and mammals, such as woodpeckers, sparrows, cottontails, and snowshoe hares. An important food source (beetles and larva) would be lost for some birds, resulting in minor long-term adverse effects. Tree removal would only occur in Developed and WUI fuel management zones. Developed areas generally have less concentration of wildlife, minimizing loss of habitat. Bark beetle management would not occur in recommended or designated Wilderness.

Some soil erosion and native plant loss may occur around a beetle-killed tree when removed, resulting in a negligible impact to wildlife habitat. Watering high-value trees and removing mistletoe would have no adverse impact on wildlife. It would have a long-term benefit to wildlife habitat if trees are better able to withstand a bark beetle outbreak.

Thinning, piling slash, burning, removal, and sanitation would have negligible to minor adverse impacts, similar to mechanical treatments. Accessing work sites and dragging slash and downed timber could result in temporary displacement, but would benefit wildlife in the long run.

Cumulative Effects: Fuel reduction, hazardous tree removal, and prescribed fire may overlap with bark beetle management activities to achieve mutual resource benefits. Burn units are inventoried and important wildlife habitat, such as a snag with cavities, is protected. Known nest sites for raptors and other wildlife habitat, such as a fox den will be identified for workers to avoid impacts. A prescribed fire would have a short-term minor adverse impact on plant and animal communities, but could result in a long-term minor to moderate benefit when communities are restored to natural conditions. Impacts to wildlife in WUI fuel management areas are addressed in the park's fire management plan (NPS 2002).

Conclusion: Alternative 1 would have a short-term negligible to minor adverse impact to wildlife due to temporary displacement while control activities are conducted. The No Action Alternative, however,

would not be effective in protecting high-value trees in developed areas of the park or in adjacent private lands. If infestations continue to spread, additional mechanical, cultural, thinning, sanitation and prescribed fire control may be required in developed high-use areas and WUI fuel management zones, causing short-term moderate cumulative adverse impacts to wildlife.

The No Action Alternative could provide minor beneficial impacts to some wildlife species as bark beetle outbreaks provide food and shelter for cavity-nesting birds and small mammals, resulting in minor beneficial impacts to some wildlife species.

Because there would be no major adverse impacts to wildlife whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative is selected.

Effects of Alternative 2 - Preferred Alternative

The environmental consequences of using mechanical, cultural, and prescribed fire techniques are the same as Alternative 1 with the exception that mechanical and sanitation techniques may be used in recommended Wilderness adjacent to private land, resulting in a negligible to minor impact to wildlife. Mitigation measures and the small number of trees that may be removed along the park boundary would result in minor localized adverse impacts on wildlife. Areas recommended for treatment in recommended Wilderness would be surveyed for nests and snags with cavities to ensure wildlife habitat is protected.

Carbaryl will not be used in recommended Wilderness and will have no adverse effect on wildlife in undeveloped areas. Used in developed areas, carbaryl has the potential to enter systems and bioaccumulate in fish. The amount of insecticide proposed, the number of trees proposed for treatment, and avoidance of aquatic habitats would result in no adverse impact to fish species within RMNP. Carbaryl could result in a short-term minor impact to terrestrial wildlife, similar to effects on T&E and rare wildlife species (p. 35-36). Carbaryl would not be used within 100-feet of aquatic, wetland and riparian areas, which would protect all fish species. Mitigation measures intended to minimize drift.

Carbaryl is extremely toxic to aquatic invertebrates, but treatments are not proposed in or near water where they thrive. It is also toxic to bees through direct treatment or residues found on blooming plants. Sevin® brand XLR PLUS carbaryl is less hazardous to honey bees than other carbaryl products when direct application to bees is avoided and spray residues have dried. Carbaryl has a minor to moderate impact to moths and butterflies. To minimize impacts, carbaryl would be applied in late evening or early morning when insects are less likely to forage. Drift would be minimized to reduce residues on wildflowers. Once residue dries, impacts to insects are reduced.

Cumulative Effects: Fuel reduction and herbicide use are ongoing activities that occur in areas proposed for bark beetle management. Together, these controls pose a minor short-term impact to wildlife due to temporary displacement while work is conducted. The long-term impact to wildlife is beneficial as forest health is maintained and the need for control activities subsides.

Conclusion: Alternative 2 would have a minor impact if carbaryl was allowed to bioaccumulate in wildlife or residue impacts terrestrial and aquatic insects. It is anticipated that high-value trees in developed areas of the park and on private land adjacent to the park would be protected at a higher level than the No Action Alternative. Bark beetle impacts to high-value trees would decrease as the full range of IPM techniques are implemented, resulting in a long-term moderate benefit to wildlife. As infestations subside, cumulative impacts to wildlife would be ameliorated.

The Preferred Alternative would provide the greatest benefit to high-value trees. Negative impacts from insecticide use are expected to decrease as the outbreak subsides. Once high-value trees are no longer at risk, carbaryl would be discontinued. Spraying high-value trees is not warranted when infested trees are further than ¼ mile away. Some wildlife would be temporally displaced during control operations, resulting in a short-term negligible to moderate impact. Great care would be used during insecticide

applications to protect non-target insects. Wetlands would be avoided to minimize adverse impacts to riparian-dependent species.

Because there would be no major, adverse impacts to wildlife whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 2 is selected.

WILDERNESS

Intensity Level Definitions

Analyses of the potential intensity of impacts on wilderness were derived from park files, the 2001 Backcountry/Wilderness Management Plan, the 1999 Wilderness and Preservation Management manual, minimum tool analysis and park staff's observations of the effects of control techniques. Predictions on short- and long-term site impacts were based on existing inventory and monitoring data of bark beetle locations requiring treatments. The thresholds of change for the intensity of impacts to wilderness are defined as follows:

Negligible: The impact would be so small that it would not be of any measurable or perceptible consequence.

Minor: The impact is slight but would be small and localized and of little consequence.

Moderate: The impact is readily apparent, would be measurable and consequential, but more localized.

Major: The impact is severely adverse or exceptionally beneficial. The change would be measurable and the consequences could be permanent.

Effects of Alternative 1 - No Action Alternative

Under the No Action Alternative, control treatments are prohibited in recommended or designated Wilderness. Beetle control activities proposed adjacent to recommended Wilderness at McGraw Ranch, Holzwarth Homestead, Aspenglen Campground, and some areas of Moraine Park could have a short-term minor indirect adverse effect on wilderness values such as wildlife presence and natural sound. Noise from beetle treatment activities could filter into Wilderness, resulting in an indirect short-term negligible to minor impact.

Cumulative Effects: Prescribed fire could occasionally occur in and adjacent to recommended Wilderness, as per management strategies addressed in the 1992 Fire Management Plan and 2002 WUI Fuels Management Plan, and may not necessarily be specific to bark beetle management. Prescribed fire would help maintain healthy forests, better able to withstand bark beetle outbreaks while also reducing fire risk in WUI areas. Prescribed fire activities would have a short-term minor impact related to burning, but would have long-term benefits in sustaining forest health in recommended or designated Wilderness. Cumulative effects are addressed in RMNP's 2002 Fire Management Plan and 2002 WUI Fuels Management Plan.

Conclusion Indirect short-term negligible to minor impacts may occur through work performed adjacent to recommended Wilderness. The No Action Alternative, however, would not be effective in protecting high-value trees in developed areas of the park nor in adjacent private lands along the park boundary. If bark beetles continue to spread within the park, additional mechanical, cultural, thinning, sanitation and prescribed fire controls may be required in Developed and WUI fuel management zones adjacent to wilderness, prolonging impacts to wilderness resources.

Mitigation measures will increase protection of wilderness resources and values from fire and WUI fuels management related to beetle control outside wilderness. The overall effects of the No Action Alternative on Wilderness would be negligible.

Because there would be no major, adverse impacts to wilderness whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 1 is selected.

Effects of Alternative 2 - Preferred Alternative

The Preferred Alternative allows mechanical bark beetle controls in recommended Wilderness adjacent to private lands and within 150 feet of the park boundary. This would result in minor to moderate short-term adverse impacts, but would not diminish suitability for wilderness designation. By implementing mitigation measures, the adverse effects of using mechanical and sanitation techniques in the Preferred Alternative would remain minor.

Insecticide use is prohibited in recommended or designated Wilderness in RMNP, resulting in no impacts from chemicals.

Cumulative Effects: Prescribed fire would occasionally occur in and adjacent to recommended Wilderness, according to strategies identified in the 1992 Fire Management Plan and 2002 WUI Fuels Management Plan, and may not be specific to bark beetle management. Prescribed fire would have a minor long-term indirect beneficial impact to wilderness resources by sustaining healthy forests that are better able to withstand bark beetle outbreaks while reducing fire risk in WUI areas. Prescribed fires would have a short-term minor adverse impact related to burning.

Conclusion: The Preferred Alternative would have a short-term minor to moderate impact to wilderness values but would not diminish suitability for wilderness designation. Mitigation measures would reduce the overall impact to a minor level. Bark beetle outbreaks are considered a natural process in Wilderness and no control activities will occur in designated Wilderness and Research Natural areas. Bark beetle-infested trees along the park boundary when adjacent to private land may occasionally be removed, but would not be controlled in the vast majority of recommended Wilderness. No insecticide will be used in Wilderness. Park wide, bark beetle management activities would decrease as the full range of IPM techniques is implemented. There will be a long-term moderate benefit to wilderness as beetle outbreaks subside. Control work would cease and cumulative impacts to Wilderness would be ameliorated.

Because there would be no major, adverse impacts to wilderness whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if the Preferred Alternative is selected.

AIR QUALITY

Intensity Level Definitions

Analyses of the potential intensity of impacts from the effects of bark beetle management techniques on air quality were derived from park files and literature cited in this plan. The thresholds of change for the intensity of impacts to air quality are defined as follows:

Negligible: The impact would be so small that it would not be of any measurable or perceptible consequence.

Minor: The impact is slight but would be small and localized and of little consequence.

Moderate: The impact is readily apparent, would be measurable and consequential, but more localized.

Major: The impact is severely adverse or exceptionally beneficial. The change would be measurable with possible permanent consequences.

Effects of Alternative 1 - No Action Alternative

The No Action Alternative would have a negligible impact on air quality. Using gasoline-powered chainsaws used to remove beetle-infested/dead trees would generate pollutants, which could create a direct short-term localized negligible adverse impact.

Mechanical treatment is labor intensive and does not effectively protect high-value trees. Consequently, periodic re-treatment is expected during a peak outbreak, prolonging beetle management activities.

Thinning and sanitation would result in a negligible impact to air quality. Watering and mistletoe removal would have no impact on air quality.

Cumulative Effects: Fire is a natural component of the ecosystem, but has been suppressed throughout RMNP over many years. Prescribed fires for resource benefit are being used to maintain healthy native plant communities in some habitat types. State smoke permits are required and prescriptions are designed to minimize smoke impacts on air quality (addressed in the 1992 Fire Management and 2002 Wildland-Urban Interface Fuels Management plans). Prescribed fire would result in a short-term localized minor adverse impact on air quality, but would create a long-term minor benefit when ecological balance is restored.

Conclusion: The No Action Alternative has a short-term impact on air quality resulting from gasoline-powered chainsaw use. Prescribed fire causes smoke, resulting in a short-term localized minor adverse effect on air quality and a long-term beneficial effect in maintaining healthy forests that are better able to withstand beetle infestations.

Because there would be no major, adverse impacts to air quality whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 1 is selected.

Effects of Alternative 2 - Preferred Alternative

The environmental consequences of using mechanical, thinning, sanitation, and cultural techniques are the same as Alternative 1. Using mechanical and sanitation techniques in recommended Wilderness adjacent to private land would result in short-term negligible adverse impacts to air quality.

Insecticide use could pose a short-term minor adverse impact to air quality, principally from drift. Impacts to air quality can be reduced by limiting spraying to calm, windless days. Using drift reduction techniques and spot treatment strategies, and not spraying when rain is imminent or wind exceeds 5mph, would further minimize air quality impacts to a negligible level.

Cumulative Effects: Impacts to air quality in proposed treatment areas are primarily due to pollutants originating outside the park. When combined with pollutants inside the park, such as vehicles, chainsaws, herbicides, insecticides, and prescribed fire, impacts to air quality increase under the Preferred Alternative. Mitigation measures associated with insecticide use will minimize impacts to a negligible level.

Conducting prescribed fires on land previously treated with carbaryl is problematic as insecticides do not evaporate easily. Chemicals released through burning could be carried in air currents beyond the treatment area, resulting in minor short-term adverse effects on air quality and the people and wildlife exposed to it.

To minimize adverse effects, insecticide application would be coordinated with fire management staff and prescribed fire activities. Carbaryl would be applied at least one year ahead of a prescribed burn or more than two months after to maintain safe air quality for park employees, visitors, neighbors, and wildlife. If a wildfire occurs following a carbaryl application, chemicals could be released into the air, resulting in minor short-term adverse effects.

Conclusion: Numerous mitigation measures and coordination of bark beetle controls with herbicide and fire management activities will ensure that the combination of fire, invasive exotic plant control, and bark beetle management activities will cumulatively have a negligible to minor impact to air quality.

With a successful bark beetle management program, the use of carbaryl would be significantly reduced over time. Once an outbreak begins its downward cycle, carbaryl use would cease, eliminating adverse impacts to air quality.

Because there would be no major, adverse impacts to air quality whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if either Alternative 1 or 2 is selected.

CULTURAL RESOURCES

Intensity Level Definitions

Analyses of the potential intensity of impacts on cultural resources were derived from park files, the park archeologist and park staff observation of the effects of management techniques. Predictions on short- and long-term site impacts were based on existing inventory and monitoring data from RMNP. The thresholds of change for the intensity of impacts to cultural resources are defined as follows:

- No impact:** For purposes of Section 106, the determination of effect would be *no adverse effect*.
- Negligible:** Impact is at the lowest levels of detection, barely measurable consequences, either adverse or beneficial, to prehistoric or historic resources. For purposes of Section 106, the determination of effect would be *no adverse effect*.
- Minor:** Adverse: Site disturbance results in little, if any, loss of cultural significance or integrity and the National Register eligibility of the site is unaffected. For purposes of Section 106, the determination of effect would be *no adverse effect*.
Beneficial: Bark beetle management activities result in maintenance and preservation of a site. For purposes of Section 106, the determination of effect would be *no adverse effect*.
- Moderate:** Adverse: Site disturbance does not diminish the cultural significance or integrity of the site to the extent that its National Register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be *adverse effect*.
Beneficial: Bark beetle management activities result in protection of high-value trees in a site. For purposes of Section 106, the determination of effect would be *no adverse effect*.
- Major:** Adverse: Site disturbance diminishes the cultural significance and integrity of the site to the extent that it is no longer eligible to be listed in the National Register of Historic Places. For purposes of Section 106, the determination of effect would be *adverse effect*.
Beneficial: Bark beetle management activities result in maintenance and preservation of a site. For purposes of Section 106, the determination of effect would be *no adverse effect*.

ARCHAEOLOGICAL RESOURCES

Effects of Alternative 1 - No Action Alternative

There are no known archeological resources in proposed bark beetle management areas. However, the potential for encountering them during beetle management work exists. Mitigating measures call for the survey of all proposed management areas for archeological resources. Should archeological resources be encountered, activities will cease until a qualified archeologist documents the resources and clears the project area.

Alternative 1 could result in a minor adverse impact on archeological resources, if found, through hazardous tree removal, thinning, sanitation, and prescribed fire. Watering high-value trees would have no adverse affect on archeological resources.

Thinning could have a minor impact on archeological resources, but would only occur in WUI fuel management areas, as addressed in the WUI Fuels Management Plan (NPS 2002).

All prescribed fires would be reviewed and approved by the park archeologist prior to implementation to ensure archeological resources are not affected. High-value trees would be protected during a prescribed fire.

Cumulative Effects: Tree removal, piling slash, pile burning, and prescribed fire are ongoing management techniques for hazardous fuel reduction and WUI management activities as well as for bark beetle management. These activities will be coordinated with fire management staff and the park archeologist to ensure that there are no adverse effects on archeological resources.

Alternative 1 has not proven effective for protecting high-value trees from beetle infestations in RMNP. If outbreaks continue, additional mechanical and sanitation techniques would be required, which could result in minor adverse impacts to potential archeological resources. Cumulative impacts from thinning and prescribed fire on archeological resources are addressed in the 2001 WUI Plan and 1992 Fire Management Plan.

Conclusion: While there are no known archeological resources in proposed treatment areas, potential for encountering them exists. Mitigating measures call for the survey of all proposed beetle management areas for archeological resources. Should they be encountered, activities will cease until a qualified archeologist documents the resources and clears the project area.

Because there would be no major, adverse impacts to cultural resources whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if Alternative 1 is selected.

Effects of Alternative 2 - Preferred Alternative

The effects of Alternative 2 are the same as the No Action Alternative, except that the use of carbaryl requires driving a truck, tractor, or ATV off-road to apply carbaryl in frontcountry areas. This could only proceed with clearance from the park archeologist. No vehicles would leave the road at the Grand Lake Cemetery.

Carbaryl would not be used in recommended or designated Wilderness, causing no adverse impacts to archeological resources in 95 percent of the park.

Cumulative Effects: Cumulative effects are the same as in the No Action Alternative. It is anticipated that carbaryl use would decrease as the full range of IPM techniques are implemented. Mechanical and sanitation controls would also decrease and eventually ameliorate cumulative impacts to archeological resources.

Conclusion: Disturbance of potential archeological resources will be mitigated by archeological surveys, documentation, and clearance by the park archeologist, resulting in negligible adverse impacts. The use of a motorized vehicle to apply carbaryl in front country areas may impact some resources, but guidance by the park archeologist would ensure that no adverse impacts occur.

Because there would be no major, adverse impacts to cultural resources whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if the Preferred Alternative is selected.

CULTURAL LANDSCAPES

Effects of Alternative 1 – No Action Alternative

Under the No Action Alternative, continued loss of high-value trees could have a minor adverse effect on the aesthetics and integrity of cultural landscapes, such as McGraw Ranch, Holzwarth Homestead, and other historic districts. Furthermore, dead trees can pose fire and safety hazards to both people and landscape features.

Mechanical removal and sanitation treatments to control beetle infestations would result in a minor short-term adverse impact to cultural landscapes, but a minor long-term beneficial impact by removing infested trees, thus reducing the risk of other high-value trees succumbing to bark beetles.

Watering high-value trees and removing mistletoe-infested branches in cultural landscapes during drought would help reduce stress to high-value trees. This would improve their ability to resist beetle attacks, resulting in a minor short-term benefit to the integrity and aesthetics of cultural landscapes.

Cumulative: If bark beetles continue to infest high-value trees under the No Action Alternative, additional mechanical and sanitation control would be required, creating cumulative impacts to the integrity and aesthetics of cultural landscapes. Cumulative impacts from thinning and prescribed fire are addressed in the 2001 WUI plan and 1992 Fire Management Plan.

Conclusion: The IPM techniques currently being used are not 100 percent effective at protecting high-value trees in cultural landscapes. Dead trees could result in a direct minor adverse effect on the viewshed of a cultural landscape. They also pose fire and safety hazards to both people and resources, and must be removed. New trees can be planted in their place, resulting in a minor long-term beneficial effect.

Because there would be no major, adverse impacts to cultural resources whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if the Preferred Alternative is selected.

Effects of Alternative 2 - Preferred Alternative

The consequences of the Preferred Alternative are the same as Alternative 1, except that high-value trees in cultural landscapes would receive greater protection from the use of carbaryl, resulting in a minor long-term beneficial impact. Spraying carbaryl would have no adverse impact on a cultural landscape as the aesthetics and integrity would not be altered.

Because dead and dying trees could negatively affect the viewshed in a cultural landscape, their removal is desirable. Furthermore, because they pose fire and safety hazards to both people and landscape features, they must be removed. New trees can be planted in their place, resulting in long-term minor benefits to the aesthetics of cultural landscapes.

Cumulative Effects: Exotic plants are being managed by mechanical and chemical techniques in the McGraw Ranch, Never Summer Ranch, and Beaver Meadows areas where bark beetle management will occur. This could result in a moderate short-term adverse cumulative impact, with a minor long-term beneficial impact to aesthetics and integrity of cultural landscapes (Exotic Plant management plan, EA, 2002). Management activities will be coordinated to minimize adverse effects.

Conclusion: While short-term minor to moderate adverse effects can occur to cultural landscapes under the Preferred Alternative, minor long-term benefits would result from the increased protection afforded to high-value trees with the use of carbaryl, ultimately protecting the aesthetics and integrity of the landscape.

Because there would be no major, adverse impacts to cultural resources whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if the Preferred Alternative is selected.

VISITOR EXPERIENCE

Intensity Level of Definitions

Rocky Mountain National Park was established to provide for the freest use of the park for recreation and for the preservation of natural conditions, scenic beauty, and wildlife. Methodology used for assessing impacts to visitor experience is based on how proposed bark beetle management would affect visitors' enjoyment of the park's resources. The thresholds for this impact are as follows:

- Negligible:** Visitors would not be affected or changes in visitor use and/or experiences would be below or at the level of detection. Any effects would be short-term. The visitor would not likely be aware of the effects associated with the alternative.
- Minor:** Changes in visitor use and/or experience would be detectable, although the changes would likely be short-term. The visitor would be aware of the effects associated with the alternative, but effects would be slight.
- Moderate:** Changes in visitor use and/or experience would be readily apparent and likely long-term. The visitor would be aware of the effects associated with the alternative, and would likely be able to express an opinion about the changes.
- Major:** Changes in visitor use and/or experience would be readily apparent and have substantial long-term consequences. The visitor would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.

Effects of Alternative 1 – No Action Alternative

Mechanical control of bark beetles (cutting by hand or by chainsaws, dragging logs, piling slash) cause noise and disturbance in treatment areas such as campgrounds and picnic areas, resulting in minor to moderate adverse impacts on visitor experience. Management activities would occur primarily during the fall, winter, and early spring when visitation is lower in localized developed areas of the park, causing short-term direct adverse impacts from the noise of powered equipment and visual impacts from work crews removing trees. No mechanical treatments would occur in recommended or designated Wilderness.

Watering high-value trees or cutting mistletoe-infested branches would have a minor long-term aesthetic beneficial impact on the visitor experience because this technique offers greater protection of high-value trees that provide screening and shade, important to the visitor experience.

Prescribed fire, used to restore ecological balance in forests, reduce fuel loads, or burn beetle-infested slash piles, could cause a short-term minor adverse impact on the aesthetic quality of park views, possibly affecting sightseeing experiences. Burns result in blackened ground and vegetation loss, which is perceived by some visitors as an adverse visual impact. Usually native grasses and forbs return within one year. Smoke may reduce the quality of a scenic vista for a short time, causing visitor concern, but prescribed burns are not conducted if conditions are not favorable for smoke dispersion.

Thinning in WUI areas would have a short-term localized minor adverse impact on visitor experience, as addressed in the WUI Fire Management plan, 2002. There would be short-term noise and visual impacts during work. Following thinning operations, visitors can see slash piles, and ultimately burnt ground and ashes in the natural landscape. Thinning, however, has a long-term beneficial impact, resulting in healthy trees, better able to withstand a bark beetle outbreak.

Sanitation proposed in campgrounds, picnic areas, road corridors, and cultural landscape areas could cause minor short-term direct impacts on visitors' experience. Usually beetle-infested trees are removed, piled out of view, and burned when conditions are favorable, to reduce visual impacts. Removal of a significant number of high-value trees would result in a moderate long-term adverse impact on aesthetic values due to tree loss for shade and screening in campgrounds and picnic areas. Remaining high-value trees, however, would be better protected, resulting in a minor beneficial impact on the visitor experience. Mature trees will eventually return, but may take up to 100 years.

Cumulative Effects: Thinning, sanitation, piling slash, pile burning, and prescribed fire are ongoing activities to achieve resource benefits in RMNP (Fire Management Plan, 1992, WUI Fuels Management, 2002). These activities, along with bark beetle control efforts, could cumulatively result in a short-term direct minor adverse impact to visitors. These effects would be temporary, however, and visitors would receive long-term minor beneficial impacts resulting from the aesthetics of a healthier forest and protection of high-value trees, necessary for screening and shading in campgrounds and picnic areas. Visitors to historic districts, such as Holzwarth Homestead, will also visually benefit from better protected trees in cultural landscapes in the park.

Conclusion: Noise and aesthetics are the primary short-term minor direct impacts to the visitor experience. Beetle control activities will be implemented during low visitation periods and kept out of sight from visitors to the extent possible. No activities will occur in recommended or designated Wilderness.

Because there would be no major, adverse impacts to cultural resources whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if the No Action Alternative is selected.

Effects of Alternative 2 - Preferred Alternative

The environmental consequences of using mechanical, cultural, thinning, sanitation and prescribed fire are the same as Alternative 1 with the exception that mechanical and sanitation methods would occasionally be used in areas along the park boundary in recommended Wilderness adjacent to private land, resulting in short-term direct minor to moderate adverse impacts to visitors who value wilderness resources.

Using an insecticide would have a short-term direct localized minor adverse impact on the visitor experience due to the intrusion and noise of a sprayer. Furthermore, spraying in Moraine Park and Timber Creek campgrounds would require a 12-24-hour closure in campsite loops, causing inconvenience and resulting in a short-term direct minor to moderate adverse impact to some visitors. Park attractions, like the Holzworth Ranch, may also experience closures, also resulting in short-term

direct minor adverse impacts on a small percent of visitors. There would be long-term minor benefits from better-protected high-value trees that provide screening, shade, and aesthetics to the visitor experience.

By April 30th each year, park staff would identify park locations where insecticide application is warranted and limit treatment to these areas. If the Preferred Alternative is implemented in 2005, spraying would occur in late summer/early fall in Moraine Park and Timber Creek campgrounds, the Holzworth and McGraw ranches, and around the Beaver Meadows Visitor Center, park utility areas, and Grand Lake Cemetery. RMNP would identify trail segments, trailheads, picnic areas, parking lots and campsites within or adjacent to treatment areas as well as campgrounds that would remain chemical free for that year. This information will be available to the public in advance via the RMNP website, printed media, press releases, signage, information kiosks, and other focal points to prepare visitors and reduce disappointments. Treatment location, time, and duration of closures will be included.

Insecticide applications would not occur between Memorial Day and Labor Day to reduce impacts during peak visitation. Treatment areas, including parking lots, trails, picnic areas, and campsites will be posted with signs. Signs will remain in place up to 60 days following application. Closures will be reopened no sooner than 12 hours after application, as directed on the chemical manufacture's label, and no later than 24 hours to minimize adverse impacts to visitors.

Cumulative Effects: Cumulative impacts from mechanical treatments on the visitor experience are the same as the No Action Alternative. Carbaryl was sprayed around the Beaver Meadows National Historic Landmark, the east-side Utility Area, and Moraine Park Campground in 1998 to protect beetle-infested trees with effective results and no long-term adverse impacts. Cumulatively, impacts from using the full range of IPM techniques would result in a minor short-term adverse effect .

Conclusion: Noise and visual disturbance from mechanical treatments will result in a short-term minor impact to the visitor experience in developed areas and historic districts in the park. Insecticide application requires localized closures, and consequently would have a short-term direct minor adverse impact to the visitor experience. Mitigation measures will be strictly followed to minimize visitor inconvenience.

Because there would be no major, adverse impacts to cultural resources whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if the Preferred Action Alternative is selected.

HUMAN HEALTH AND SAFETY

Analyses of the potential intensity of impacts from bark beetle management activities were derived from park files and literature cited in this plan. Methodology for assessing insecticide impacts to human health and safety were evaluated on the following sources:

- Technology Transfer Network Air Toxics Website (EPA, 2004)
<http://www.epa.gov/ttn/atw/hlthef/carbaryl.html>
- Attia et al. (1991)
- Risk Assessment for Pesticide Use (USDA-USFS, 1992)
- Cox (1993)
- Occupational Safety & Health Administration (OSHA)
http://www.osha.gov/dts/chemicalsampling/data/CH_225100.html
- Sevin® Brand Carbaryl Material Safety Data Sheets.
- Hastings et al. (2001)
- Sevin® Brand Carbaryl Specimen Labels
- Carbaryl Pesticide Fact Sheet <http://infoventures.com/e-hlth/pesticide/carbaryl.html>
- The problem with Sevin® (Carbaryl) <http://www.monitor.net/~cap/Sevin.html>
- http://design.ntnu.no/ansatte/hertwich/HTP_ETC.html

Intensity Level Definitions

- Negligible:** Human health and safety would not be affected or would be at or below the lowest detection level. There would be “no observed effect” on park visitors, employees, residents, or contractors.
- Minor:** The effect could be detectable, but of a magnitude that would not have an appreciable adverse or beneficial impact to human health and safety. If mitigations were needed to offset adverse effects, they would be relatively simple and successful.
- Moderate:** The effects would be readily apparent and result in noticeable adverse or beneficial health and safety consequences to park visitors, employees, residents, and contractors. Exposure could exceed acceptable daily impacts. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.
- Major:** Effects would be readily apparent and would pose substantial health and safety risks to park visitors, employees, residents, and contractors. Mitigation measures to offset adverse effects would be needed, could be expensive, and their success could not be guaranteed.

Effects of Alternative 1 - No Action Alternative

Using a chainsaw, dragging heavy logs, and piling slash could have a minor direct adverse impact on human health and safety if accidents occur. Hazards include falls, scrapes, scratches, puncture wounds, and eye irritation from flying debris. Workers may also be at risk from biting or stinging insects. Park employees and volunteers conducting strenuous mechanical control activities in summer may face risks including dehydration, fatigue, heat exhaustion, and heat stroke.

Watering high-value trees or cutting mistletoe-infested branches would have a negligible to minor impact on human health and safety. Park employees and volunteers could be injured performing these activities.

Prescribed fire activities would have a short-term minor impact on public health and safety. Smoke produced from prescribed fires can irritate eyes and lungs and can cause respiratory problems. Prescribed fires would only occur in small, localized areas and only on days favorable for smoke dispersal. Visitors would be alerted and able to avoid these areas. Fire fighters are encouraged to stay upwind to avoid smoke inhalation. Limited use of prescribed fire as discussed in the park’s Fire Management Plan and WUI Fuels Management Plan is possible near the park boundary, so minor impacts to nearby residents related to smoke may occur.

Cumulative Effects: Mechanical and cultural techniques and prescribed fire are ongoing activities to achieve resource benefits in RMNP. Cumulatively, they result in short-term minor adverse impacts to human health and safety as addressed in the 1992 Fire Management Plan and the 2002 WUI Fuels Management Plan.

Conclusion: The No Action Alternative would result in direct short-term minor adverse impacts to human health and safety, resulting from accidents, insect stings, smoke, and flying debris. Mitigation measures, such as required use of PPE, will be followed to minimize risks to human health and safety.

Because there would be no major, adverse impacts to cultural resources whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park’s resources or values if the Preferred Action Alternative is selected.

Effects of Alternative 2 - Preferred Alternative

The environmental consequences of using mechanical, cultural, and prescribed fire IPM control techniques are the same as the No Action Alternative.

Carbaryl is one of the three most commonly used insecticides in the United States with an estimated use of between 10 and 15 million pounds per year. It is used to control insects that affect over 100 agricultural crops, animals, ornamental plants, and indoor areas. The Preferred Alternative proposes its use to protect high-value trees from bark beetle infestations. Most human health concerns are related to carbaryl use in agricultural settings versus use in a forest environment to prevent tree loss.

Carbaryl impacts range from negligible to moderate adverse effects to human health and safety, depending on many factors, such as dosage, environmental conditions during application, type of exposure, and an individual's sensitivity to chemicals. Potential human health effects, based on toxicity tests in laboratory animals and studies conducted on human health, are illustrated in Table 5.

Table 5 – Impact of Carbaryl on Human Health

Insecticide/Active Ingredient Sevin® Brand Carbaryl (1-naphthyl N-methylcarbamate)	Impacts of Carbaryl on Human Health
Acute Toxicity:	In tests in male and female rats, the acute oral LD50 was 255 mg/kg. Acute dermal (skin) LD50 was greater than 2 grams/kilogram in rabbits. In laboratory tests in rabbits, carbaryl was a mild eye irritant. Death has resulted from carbaryl intentionally taken in a suicide attempt. Lower doses of carbaryl over a longer period of time may cause a variety of adverse effects. EPA has set a Lifetime Health Advisory level for carbaryl in drinking water at 700 micrograms per liter. This level includes a margin of safety to protect human health and should be considered as a guideline. EPA believes that water containing carbaryl at or below this level is acceptable for drinking every day over the course of one's lifetime, and does not pose any health concerns.
Chronic Toxicity:	Repeated overexposure may cause severe cholinesterase inhibition. The exposure levels a person could receive from contacting or consuming treated vegetation, water or animals as a result of routine operations, are below levels shown to cause harmful effects in laboratory studies.
Toxicology:	Carbaryl inhibits the enzyme, acetylcholinesterase, in a manner similar to organophosphates, but the enzyme-inhibitor complex breaks down approximately five-fold faster. Carbaryl is safer toward warm-blooded animals than most organophosphate insecticides. Carbaryl's potent anticholinesterase activity could kill mammals only by forced oral administration.
Neurotoxicity:	Dietary exposure presented no risk of neurotoxicity, and the risk to humans "is vanishingly small." Epidemiological studies have shown no symptoms of delayed neurotoxicity, dysmorphic sperm or viral enhancement in humans exposed to carbaryl.
Carcinogenicity:	It is not known to be carcinogenic to animals. Laboratory tests in rats and mice fed up to 200 ppm (rats) or 400 ppm (mice) for 2 or 1.5 years did not show any evidence of carcinogenicity. However, epidemiology studies have associated exposure to agricultural and household use of carbaryl with an increased risk of cancer in humans. At least 15 laboratory studies have been done and three of the fifteen showed that carbaryl exposure caused an increase in cancer incidence.

Developmental:	Studies with carbaryl in pregnant laboratory animals indicated that carbaryl is not a potential human teratogen (cause of birth defects).
Reproduction:	A three-generation reproduction study in rats did not show any adverse effects on fertility or reproduction at doses up to 200 mg/kg per day. Two studies at a carbaryl manufacturing facility showed that carbaryl exposure affected the quantity and quality of sperm produced by the workers. Other studies showed problems that included reduced fertility, increased fetal mortality, low birth weights, reduced growth and survival, and birth defects in eight different types of animals.
Mutagenicity:	Carbaryl was found to show weak mutagenicity (the ability to cause genetic damage), and there is no <i>in vivo</i> information which would support the likelihood of heritable problems occurring in future generations.

The Human Toxicity Potential (HTP) is used to indicate the danger of a chemical's release to air or surface water. HTP contains two elements:

1. The toxicity of the chemical. This is represented by the unit risk factor (for carcinogens) or the safe dose (RFD) for non-carcinogenic effects.
2. The potential dose. This is represented by the intake of the pollutant by an individual living in a certain model environment (Hertwich et al. 2001, Hertwich et al. 2000).

General Public: People may be exposed to carbaryl via dermal, respiratory, and dietary routes (e.g. contact with vegetation at a recently treated site, breathing herbicide vapors in or near recently treated areas, and touching or eating berries with residues). With strictly-enforced implementation of mitigation measures, it is unlikely that the general public would receive doses above "no observed effect" levels, or a negligible short-term direct impact to human health and safety.

Human cancer risks from exposure would be negligible from the small amount of insecticide proposed for use. Risks to the general public from spraying carbaryl for bark beetle control are known to be low, however, scientific research in this area is not conclusive.

Given the small amount of insecticide proposed for use and low number of trees proposed for spraying (400 in 2005 and another 400 in 2006), the potential for bioaccumulation is low, resulting in negligible effects. Park animals at the top of the food chain (eagles, coyotes, mountain lions, peregrine falcons, fox, bobcat) and humans are not expected to receive concentrated doses of the chemical by feeding on contaminated plants or animals. Carbaryl does not persist in aquatic environments, but can bioaccumulate in fish in small amounts if fish eat affected invertebrates (USDA-USFS 1996). Mitigation measures should reduce the risk to no adverse effect for fish or those animals that feed on them.

Workers: Employees and contractors applying carbaryl may be exposed via dermal, respiratory, and dietary routes, breathing spray particles or vapors during spraying operations, and by touching or eating berries with residue. Workers may be dermally exposed to carbaryl if the concentrate, mixture, or drifting spray droplets contact their skin or if workers contact sprayed vegetation. Respiratory exposure may result from inhaling air-borne spray droplets. Dermal exposure is 50 percent higher than inhalation exposure.

Routine-typical exposures are based on average conditions in application rate, number of trees treated, and doses identified in field-based exposure guides (USDA 1992). There can be an indirect effect on human health from carbaryl use through improper application, mixing, or contamination of a water source.

Workers applying carbaryl are required to use PPE as specified on the label or Material Safety Data Sheet (MSDS), including wrap-around goggles. With the required use of PPE as specified on the product label, it is unlikely workers would receive doses above the "no observed effect" level, resulting in a short-term direct negligible effect. Research shows that PPE such as long-sleeved shirts, coveralls, rubber gloves, and hats substantially reduce dermal exposure. Chemical Inhalation is reduced by using protective breathing devices. With the implementation of mitigation measures, proper use of PPE, and barring accidents, workers are unlikely to receive doses above the "no observed effect" level.

Multiple Chemical Sensitive (MCS) Population: There are individuals who are extremely sensitive to pesticides and other chemicals. Individual susceptibility to the toxic effects of carbaryl can be variable and unpredictable. The normal margin of safety is considered by toxicologists to be sufficient to ensure that most people would experience no toxic effects from carbaryl if applied in accordance with label provisions. However, chemically-sensitive individuals may experience effects from extremely small amounts of carbaryl, resulting in negligible to minor short-term direct adverse effects. RMNP will notify all persons listed in the Colorado Registry of Pesticide Sensitive Persons of planned carbaryl applications.

Notification: By April 30th each year, park staff would identify park locations where carbaryl use is warranted and limit treatment to those areas. Treated areas would be closed to the public during chemical application and for up to 24 hours after, or based on the re-entry time interval stated on the product label and MSDS sheets. Park visitors, neighbors, and inholders and chemically sensitive people near proposed treatment areas would be notified about the location and time of application and duration of closure. Mitigating measures would reduce effects to a negligible to minor short-term impact on human health and safety.

Cumulative Effects: In the spring of 1988 high-value ponderosa trees in Moraine Park and Aspenglen campgrounds and at park headquarters were sprayed with Carbaryl, with effective results. There were no known effects on human health and safety as a result of insecticide use, and bark beetles were staved off until recent drought conditions persisted. Proposed insecticide use may, however, overlap with areas being sprayed with herbicide use to manage invasive exotic plants. Used together, effects are expected to be negligible to minor when mitigation measures are followed. Proposed carbaryl use in 2005 and 2006 is expected to be effective in protecting high-value trees. Prescribed burns would not be permitted in areas where carbaryl has been applied for a period of six months to a year, so there would be no impact related to chemical exposure.

Conclusion: Using insecticides can pose risks to human health and safety from dermal, respiratory, or dietary exposure, causing direct short-term negligible to minor and direct to indirect effects. Strictly enforced mitigation measures will ensure that effects on human health and safety will be minimized. The public will be notified and treated areas will be clearly posted to reduce adverse impacts, resulting in short-term direct negligible to minor effects.

Given the small amount of carbaryl proposed for use in RMNP, the potential for bioaccumulation, cancer, and genetic damage appears to be negligible. The number of trees proposed for treatment, (about 400 in 2005 and another 400 in 2006), is low, minimizing exposure risk. Once the bark beetle outbreak is on a downward trend, the use of carbaryl would no longer be necessary, resulting in a minor long-term benefit.

Because there would be no major, adverse impacts to cultural resources whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if the Preferred Action Alternative is selected.

PARK OPERATIONS

Intensity Level Definitions

Implementation of a project can affect the operations of a park such as the number of employees needed; the type of duties that need to be conducted; when/who would conduct these duties; how activities should be conducted; and administrative procedures. The thresholds of change for the intensity of impacts to park operations are defined as follows:

Negligible: Park operations would not be affected or the effect would be at or below the lowest levels of detection, and would not have an appreciable effect on park operations.

- Minor:** The effect would be detectable, but would be of a magnitude that it would not have an appreciable adverse or beneficial effect on park operations. If mitigations were needed to offset adverse effects, it would be relatively simple and successful.
- Moderate:** The effects would be readily apparent and would result in a substantial adverse beneficial change in park operations in a manner noticeable to staff and the public. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.
- Major:** The effects would be readily apparent and would result in a substantial adverse or beneficial change in park operations in a manner noticeable to staff and the public, and be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed, could be expensive, and their success could not be guaranteed.

Effects of Alternative 1 - No Action Alternative

The No Action Alternative could alter current park operations related to bark beetle management in RMNP. If infestations continue to spread at the current rate, existing control activities would not be effective at protecting high-value trees, at preventing new infestations, or reducing risks of personal injury and property damage due to hazardous trees. Consequently, increased staff time and park resources would be needed to control outbreaks in the Colorado River District (park's west side) and in high use developed areas on the east side of the park as infestations continue to spread. This would result in a moderate adverse impact to park operations in the short-term (0-5 years).

Under the No Action Alternative, two seasonal employees would be needed to evaluate the increasing number of infested trees. Technical assistance would be needed from the park's fire crews to assist with removal and burning of hazardous trees.

Cumulative Effects: Mechanical removal, thinning, sanitation, and cultural techniques would continue in high priority areas (Moraine Park and Timber Creek campgrounds, Beaver Meadows Visitor Center, Utility areas, Moraine Park Museum, Holzwarth Homestead, and McGraw Ranch), but would probably increase as infestations continue to spread. This would cumulatively result in a short-term minor to moderate adverse effect on park operations in terms of increased time, budget, and staff devoted to these activities.

RMNP has committed funding, staff, and resources to inventory, monitor, and maintain resources contributing to the overall health of forest ecosystems, including exotic plant management, fuel reduction, and bark beetle management. These activities will continue, in concert, to achieve park resource benefits. Coordinating activities where possible will reduce cumulative impacts to park operations.

Conclusion: If bark beetle infestations continue to spread at the current rate, and if park staffing and funding devoted to bark beetle management remain unchanged, there will be insufficient resources to cope with hazard tree removal and other beetle management activities. Areas requiring treatment would likely be extended to all developed areas and all historic districts in the park to prevent infestations and high-value tree mortality, resulting in a minor to moderate adverse affect on park operations in terms of additional staff time and funding devoted to beetle management activities.

Because there would be no major, adverse impacts to cultural resources whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if the No Action Alternative is selected.

Effects of Alternative 2 - Preferred Action

Using an insecticide to control infestations would increase protection of high-value trees throughout the park. Additional funds would be needed to contract with a state-certified applicator to spray selected

areas. Chemical application on 400 trees in 2005 and another 400 trees in 2006 would require spraying one week each year, resulting in a negligible short-term impact on park operations.

A seasonal or term employee would be needed to identify target trees, oversee contract operations, keep the public safe, and sanitize any infested trees that spraying may have missed. Ultimately, however, carbaryl use would decrease the time, resources, and funds needed for bark beetle management by slowing and halting infestations, resulting in a long-term minor to moderate benefit on park operations. Being proactive in preventing infestations will reduce resource damage, safety risks, and property damage, thereby freeing staff time and funds for other resource and visitor benefits.

Cumulative Effects: Insecticide use proposed in 2005 and 2006 would reinforce current IPM techniques. This would result in a beneficial long-term impact on park operations through reduced expenditure of funds and staff time.

Carbaryl was used in 1988 in the Beaver Meadows Visitor Center, Utility, and Moraine Park campground areas with effective results. An arctic freeze followed and trees were protected until a recent drought occurred, causing more outbreaks. Staff time and equipment devoted at that time resulted in a negligible impact on park operations, but yielded positive results. Coordination with fire management activities could also streamline park operations, achieving mutually beneficial resource results.

Conclusion: Using the full range of IPM techniques to prevent infestations and protect high-value trees will result in a minor to moderate long-term benefit on park operations within the next five years from reducing the time, money, and resources needed to react to safety hazards associated with beetle-infested/killed trees.

Insecticide use affords greater protection of high-value trees by slowing and halting infestations. In the long run, less resources, and staff time would be dedicated to beetle control, which would benefit park operations

Because there would be no major, adverse impacts to cultural resources whose conservation is: 1) necessary to fulfill specific purposes identified in the enabling legislation of RMNP; 2) key to the natural or cultural integrity of the Park; or 3) identified as a goal in the Master Plan (1976) or other relevant NPS planning documents, there would be no impairment of the Park's resources or values if the Preferred Action Alternative is selected.

CONSULTATION AND COORDINATION

Preparers

The following preparers developed the Plan and EA content:

Larry Gamble, Chief of the Branch of Planning and Compliance, RMNP
Jeff Connor, Natural Resources Specialist, RMNP
Karl Cordova, Biologist, RMNP
Ron Thomas, GIS Specialist, RMNP
Judy Rosen, Editor

Agencies/Tribes/Organizations/Individuals Contacted

The following agencies and organizations were contacted for information; or assisted in identifying issues, developing alternatives, and analyzing impacts:

Arapaho Roosevelt National Forest
Arapaho National Recreation Area, Sulphur Ranger District
Department of Agriculture, United States Forest Service, Regional Office, Denver
Colorado Coalition for Alternatives to Pesticides

Colorado State Forest Service
State Historic Preservation Office (EA to be forwarded and comment as part of the Section 106 process).

Individuals Consulted

The following people assisted in identifying issues, developing alternatives, and/or analyzing impacts related to this plan. They do not necessarily agree with the proposed action or all of the material presented.

Russ Babiak, Former Fire Management Specialist, RMNP
Bob Cain, Entomologist, USFS Regional Office Denver
Jeff Witcosky, Entomologist, USFS Regional Office Denver
Tanya Shenk, Biologist, CDOW
David Leatherman, Entomologist, Colorado State Forest Service
Don Campbell, USGS, Denver
Jerry McCrea, IPM Specialist for the Intermountain Region, National Park Service
Barry Sweet, Park Ranger, RMNP
John Hannon, Park Ranger, RMNP
Vaughn Baker, Superintendent, RMNP
Laura Wheatley, Biological Technician, RMNP
Ken Czarnowski, Former Chief of Natural Resources Management, RMNP
Tim Devine, Former Wilderness Program Specialist, RMNP
Jesse Duhnkrack, Fire Management Officer, RMNP
Doug Watry, Forestry technician, RMNP
David Pillmore, Inventory and Monitoring Database Technician, RMNP
Carlie Ronca, Wildlife Biologist, RMNP
Terry Terrell, Science Officer, RMNP
Cheri Yost, Park Ranger, RMNP
Nate Williamson, Fire Effects Specialist, RMNP
Susan Wolf, Colorado Coalition for Alternatives to Pesticides, Allenspark

List of Recipients

The following agencies, organizations and individuals were sent a copy of this plan for review and comment during the 30-day public review period required by the National Environmental Policy Act.

Agencies

Colorado Dept. of Natural Resources
Colorado Division of Wildlife
Colorado Historical Society
Colorado State Forest Service
Environmental Protection Agency
Estes Valley Recreation & Park District
Northern Colorado Water Conservancy District
Town of Estes Park
Town of Grand Lake
U.S. Army Corps of Engineers
U.S. Bureau of Reclamation
U.S. Fish & Wildlife Service

Elected Officials

Boulder County Commissioners
Larimer County Commissioners
Grand County Commissioners
Colorado House dist. 13
Colorado House dist. 49
Colorado House District 57

Colorado Senate Dist. 8
Colorado Senate Dist. 15
Colorado Senate Dist. 16
Representative Marilyn Musgrave
Representative Mark Udall
Senator Ken Salazar
Senator Wayne Allard

Organizations

American Alpine Club
American Lands Alliance
Audubon Society
Biodiversity Associates
Biodiversity Legal foundation
Center for Native Ecosystems
Colorado Environmental Coalition
Colorado Mountain Club
Colorado Mule Deer Ass'n.
Colorado Natural Heritage Program
Colorado Natural Areas Program
Colorado Open Lands

Colorado Wildlife Heritage Fund
 Continental Divide Trail Alliance
 Colorado Divide Trail Society
 Environmental Defense
 Estes Park Chamber of commerce
 Estes Valley Improvement Association
 Estes Valley Land Trust
 Great Old Broads for Wilderness
 Land and Water Fund
 League of Women Voters
 Legacy Land Trust
 National Parks and Conservation Association
 Natural Resources Ecology Laboratory
 Poudre River Trust
 Rocky Mountain Elk Foundation
 Rocky Mountain Recreation Initiative
 Sierra Club
 Southern Rockies Forest Network
 The Conservation fund
 The Nature conservancy
 The Trust for Public Land
 The Wilderness Society
 Trout Unlimited
 Western Environmental Law Center
 Wilderness Watch
 Wildlands CPR

YMCA of the Rockies
Media
 Boulder Daily Camera
 Estes Park Trail-Gazette
 Fort Collins Coloradoan
 Loveland Reporter-Herald
 Longmont Times-Call
 Rocky Mountain News
 The Denver Post

Libraries
 Boulder Public Library
 Estes Park Public Library
 Fort Collins Library
 Longmont Public Library
 Loveland Public Library

Lodges and Concessionaires
 Grand Lake Lodge
 Wind River Ranch
 Sombrero Ranches
 High Country Stables
 National Park Retreats
 Wild Basin Lodge & Livery
 The Evergreens on Fall River
 Rams Horn Village Resort

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Abbreviations and Definitions

ATV	All Terrain Vehicle
CDOW	Colorado Division of Wildlife
CE	Categorical Exclusion
CNAP	Colorado Natural Areas Program
CNHP	Colorado Natural Heritage Program
DBG	Denver Botanical Gardens
EA	Environmental Assessment
ESA	Endangered Species Act
FWS	U.S. Fish and Wildlife Service
HTP	Human Toxicity Potential
IPM	Integrated Pest Management
MCS	Multiple Chemical Sensitive
MSDS	Material Safety Data Sheet
NEPA	National Environmental Policy Act
NPS	National Park Service
NRCS	Natural Resources Conservation Service, U.S. Department of Agriculture
PPE	Personal Protective Equipment
RMNP	Rocky Mountain National Park
USDA	United States Department of Agriculture
USFS	United States Forest Service
WUI	Wildland-Urban Interface Fuels Management areas

Definitions

Beetle-infested Tree – A green (live) coniferous tree that is the site of a bark beetle attack. Signs of infestation include the presence of pitch tubes around the trunk, brownish boring dust around the base of the tree or in bark crevices. The removal of bark at chest height reveals beetle galleries and developing broods.

Beetle-killed Tree – A coniferous tree that has succumbed to pine bark beetles. Discolored foliage in late spring, in conjunction with the other signs of a beetle attack (see above), is evidence that a coniferous tree has been killed by bark beetles.

Cultural landscape – A geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with an historic event, activity, or person or exhibiting other cultural or aesthetic values (NPS 2004))

Native Plants and Animals – The NPS defines native plants and animals as all species that have occurred or now occur as a result of natural processes on lands designated as units of the national park system. Native species in a place are evolving in concert with each other (NPS 2001).

Exotic plants and animals – The NPS defines exotic species as those species that occupy or could occupy park lands as the result of deliberate or accidental human activities. Because an exotic species did not evolve in concert with the species native to the place, the exotic species is not a natural component of the natural ecosystem at that place (NPS 2001).

Native pests – Native species that may have a negative impact on natural or cultural resources. The National Park Service may control native pests to conserve and protect plants, animals, and facilities in developed areas (NPS 2001).

High-value trees – Green pine and spruce trees that are considered an important resource in cultural landscapes or have aesthetic significance in developed high-use areas. Criteria used to determine high-value trees include:

- Large mature trees (usually ponderosa and lodgepole pine trees and Colorado blue spruce trees >6 inches diameter at breast height dbh) that produce a high number of cones.
- Trees located in campgrounds and picnic areas, important for shade or for screening between sites.
- Large mature trees within historic districts in culturally significant landscapes. For example, lodgepole pines and spruce at the Holzwarth Ranch, ponderosa pine at McGraw Ranch and Beaver Meadows Visitor Center/Headquarters.

Hazardous tree – A tree that may fail within three years with the potential to cause personal injury or property damage.

Insecticide – A chemical repellant used to prevent bark beetles from entering a host tree.

Integrated Pest Management (IPM) - A decision-making process that coordinates knowledge of pest biology, the environment, and available technology to prevent unacceptable levels of pest damage, by cost-effective means, while posing the least possible risk to people, resources, and the environment (NPS, 2001).

IPM techniques are aimed at:

Prevention – using long-term techniques, such as thinning and prescribed fire to reduce trees' ability to withstand bark beetle outbreaks;

Suppression – applying direct control techniques such as sanitation to address short-term needs during a bark beetle outbreak; and

Restoration – maintaining the bark beetle's role in the natural process and ecosystem integrity by allowing them to continue unchecked.

The specific IPM techniques follow:

Integrated Pest Management Techniques:

Mechanical: Using handsaws or chainsaws to remove pine or spruce trees that contain live bark beetles or larva to prevent beetles from spreading to nearby high-value trees. Beetles or larva in cut trees can be killed using one of the following methods:

- **Solarizing** – Wrapping cut trees in 6-mil clear plastic which is sealed around the edges with soil.
- **Burning** – Removing freshly cut slash from Wildland Urban Interface (WUI) areas from the vicinity of high-value trees to a central location for burning.
- **Chipping** – Chipping branches and logs into small pieces with powered equipment.
- **Sanitation** – Removing individual beetle-infested trees to reduce beetle populations and prevent further mortality.
- **Thinning** - Selectively removing trees to modify the stand environment and eventually increase residual tree vigor so that they are better able to withstand bark beetle attacks.
- **Watering and Mistletoe control** watering or removing mistletoe during drought conditions.
- **Prescribed Fire:** Using prescribed fire or using fire to kill larva in mechanically cut trees in fire-adapted ecosystems of RMNP.
- **Chemical:** Using an insecticide such as Sevin® brand XLR plus Carbaryl as a preventative spray on the trunks and larger branches of important high-value trees.

Pheromone: These chemical attractants have been artificially synthesized and are commercially available as lures specific to individual species of bark beetles. The lures are effective attractants for some species of bark beetles that serve to concentrate attacking beetles on suitable pheromone traps, but are not yet effective against bark beetles that occur in RMNP.

APPENDIX A

Dendroctonus and Ips bark beetles known in Colorado to attack pine and spruce trees

Species	Hosts	Comments
<i>Dendroctonus adjunctus</i> (roundheaded bark beetle)	<i>Pinus ponderosa</i> , <i>P. flexilis</i> , <i>P. contorta</i>	Attacks the basal portion of the bole of overstocked and pole sized trees. Flies during the fall.
<i>D. approximatus</i> larger Mexican bark beetle	<i>P. Ponderosa</i>	Attacks the basal portion of the bole.
<i>D. brevicornis</i> Western bark beetle	<i>P. ponderosa</i> , <i>P. contorta</i>	Attacks mid bole of over mature or trees weakened by drought >6 in. diameter. Introduces blue stain fungi. Can kill vigorous trees during outbreaks.
<i>D. frontalis</i> southern bark beetle	<i>P. ponderosa</i> ,	Rarely a pest in the Western states.
<i>D. ponderosae</i> mountain bark beetle	<i>P. ponderosa</i> , <i>P. contorta</i> , <i>P. flexilis</i> ,	The bark beetle in RMNP currently killing thousands of trees. Attacks the entire bole of trees >4 in. diameter. Can kill numerous trees during outbreaks.
<i>D. valens</i> red turpentine beetle	<i>P. ponderosa</i> , <i>P. contorta</i>	Attacks lower bole and root crown of weakened or injured trees.
<i>Ips hunteri</i>	<i>Picea pungens</i>	This is a common species affecting Colorado blue spruce in landscape settings. Upper bole are typically infested first.
<i>Ips pilifrons</i>	<i>Picea pungens</i>	A forest species often called the "spruce ips"; tends to infest the upper part of fallen trunks.
<i>Ips pini</i>	<i>P. ponderosa</i> , <i>P. contorta</i>	The most common species associated with other pines in Colorado
<i>Ips knausi</i>	<i>P. ponderosa</i>	Common at base of trunk and in fresh stumps.
<i>Ips calligraphus</i> six spined ips	<i>P. ponderosa</i>	Largest <i>Ips</i> species in Colorado; often in main trunk. Attacks the lower bole of large trees.
<i>Ips integer</i>	<i>P. ponderosa</i> , <i>P. contorta</i> ,	Attacks the entire bole of weakened and felled trees.
<i>Ips woodi</i>	<i>P. flexilis</i>	
<i>Ips borealis</i>	<i>Picea engelmannii</i>	
<i>Ips mexicanus</i> Monterey pine ips	<i>P. Flexilis</i> , <i>P. contorta</i>	Attacks the bole of lining, injured or dying trees

Species	Hosts	Comments
<i>Ips latidens</i>	<i>P. ponderosa</i>	Attacks three and five needle pines

Pinus ponderosa – ponderosa pine; *P. contorta* – lodgepole pine; *P. flexilis* – limber pine; *Picea pungens* – Colorado Blue spruce; *P. engelmannii* – Engelmann spruce

APPENDIX B

Threatened and Endangered Unit Species List Endangered Species Act (ESA) Rocky Mountain National Park

December 2004

The following table contains a list of species that are specific to Rocky Mountain National Park and are federally listed as endangered, threatened or candidates for listing, by the U.S. Fish and Wildlife Service under the provisions of the Endangered Species Act. The U.S. Fish and Wildlife Service has reviewed the list and provided a letter of concurrence dated January 15, 2004.

The species that are included in the table must meet one of the following criteria:

1. The species is known to occur within the park.
2. The species does not occur within the park, but suitable habitat is available, the habitat is within the known elevation range for the species, and the species is known to exist in counties that the park occupies.
3. The species does not occur within the park, but actions within the park have the potential to affect the species.

In compliance with the Endangered Species Act, all management actions within the park are evaluated to determine if they will have any effect on endangered, threatened or candidate species on this list.

Federally Listed and Candidate Species & Their Status in Colorado	Known to Occur in RMNP	Known to Occur in Boulder County	Known to Occur in Larimer County	Known to Occur in Grand County
Amphibians				
Boreal toad, <i>Bufo boreas boreas</i> , Candidate for Listing	Yes	Yes	Yes	Yes
Birds				
Bald Eagle, <i>Haliaeetus leucocephalus</i> , Threatened	Yes	Yes	Yes	Yes
Least tern, <i>Sterna antillarum</i> , Endangered	No	▲	▲	No
Mexican spotted owl, <i>Strix occidentalis lucida</i> , Listed Threatened	No	Yes Historically	Yes Historically	No
Piping plover, <i>Charadrius melodus</i> , Threatened	No	▲	▲	No
Whooping crane, <i>Grus americana</i> , Endangered	No	▲	▲	No
Yellow-billed cuckoo, <i>Coccyzus americanus</i> , Candidate for Listing	Yes Historically	No	Yes	Yes
Fish				
Bonytail, <i>Gila elegans</i> , (presumed-historical) Endangered	No	No	No	*
Colorado pikeminnow,	No	No	No	*

Federally Listed and Candidate Species & Their Status in Colorado	Known to Occur in RMNP	Known to Occur in Boulder County	Known to Occur in Larimer County	Known to Occur in Grand County
<i>Ptychocheilus lucius</i> , Endangered				
Greenback cutthroat trout, <i>Oncorhynchus clarki stomias</i> , Threatened	Yes	Yes	Yes	No
Humpback chub, <i>Gila cypha</i> , Endangered	No	No	No	*
Pallid sturgeon, <i>Scaphirhynchus albus</i> , Threatened	No	▲	▲	No
Razorback sucker, <i>Xyrauchen texanus</i> , Endangered	No	No	No	*
Mammals				
Canada lynx, <i>Lynx canadensis</i> , Threatened	Yes	Yes	Yes	Yes
Preble's meadow jumping mouse, <i>Zapus hudsonius preblei</i> , Threatened	No	Yes	Yes	No
Plants				
Colorado butterfly plant, <i>Gaura neomexicana</i> spp. <i>coloradensis</i> , Threatened	No	Yes	Yes	No
Utes ladies'-tresses, <i>Spiranthes diluvialis</i> , Threatened	No	Yes	Yes	No

Table Terminology

*	Water depletions in the Upper Colorado River basin may affect these species
▲	Water depletions in the South Platte River basin may affect these species
Candidate	Means there is sufficient information indicating that formal listing under the ESA maybe appropriate
Endangered	Means the species could become extinct
Threatened	Means the species could become endangered

APPENDIX C



United States Department of the Interior

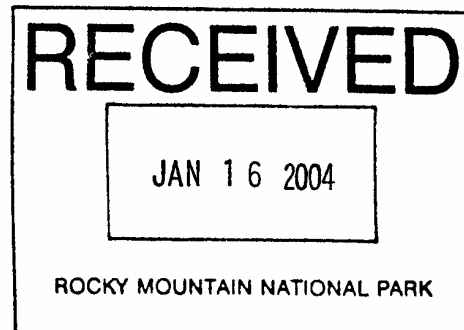
FISH AND WILDLIFE SERVICE

Ecological Services
Colorado Field Office
755 Parfet Street, Suite 361
Lakewood, Colorado 80215

IN REPLY REFER TO:

ES/CO: USFS/AR
Mail Stop 65412

JAN 15 2004



Mr. Larry Gamble
Chief, Branch of Planning & Compliance
Rocky Mountain National Park
Estes Park, Colorado 80517

Dear Mr. Gamble:

The U.S. Fish and Wildlife Service has received your December 18, 2003, correspondence requesting concurrence for your revised Threatened and Endangered Unit Species List (revised December 18, 2003). The purpose of the "unit species list" is to streamline the section 7 consultation required of Federal agencies under the Endangered Species Act. This list would eliminate the Rocky Mountain National Park agencies from having to request a threatened and endangered species list each time they require consultation with the Service.

The Service concurs with your reasoning and determination for not including black-footed ferret (*Mustela nigripes*), Osterhout milkvetch (*Astragalus osterhoutii*), Penland beardtongue (*Penstemon penlandii*), and black-tailed prairie dog (*Cynomys ludovicianus*). The Service also concurs that the following listed species may be affected by activities of the Rocky Mountain National Park and consultations will be needed. Although candidate species presently receive no protection under the Act, it is within the spirit of the Act to consider project impacts to potentially sensitive species. Please be aware that threatened and endangered species lists should be updated every 90 days by telephone or in writing. If the update requires a change in the list below, the change will be documented in writing. The following species are of potential concern for your projects.

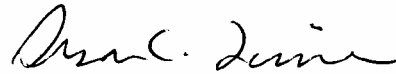
Unit Species List for the Rocky Mountain National Park

Bald eagle	<i>Haliaeetus leucocephalus</i>
Bonytail	<i>Gila elegans</i>
Boreal toad	<i>Bufo boreas boreas</i>
Canada lynx	<i>Lynx canadensis</i>
Colorado butterfly	<i>Gaura neomexicana</i> spp. <i>Coloradensis</i>
Colorado pikeminnow	<i>Ptychocheilus lucius</i>
Greenback cutthroat	<i>Oncorhynchus clarki stomias</i>
Humpback chub	<i>Gila cypha</i>
Least Tern	<i>Sterna antillarum</i>
Mexican spotted owl	<i>Strix occidentalis lucida</i>

Pallid sturgeon	<i>Scaphirhynchus albus</i>
Piping plover	<i>Charadrius melodus</i>
Preble's meadow jumping mouse	<i>Zapus hudsonius preblei</i>
Razorback sucker	<i>Xyrauchen texanus</i>
Ute ladies'-tresses	<i>Spiranthes diluvialis</i>
Whooping crane	<i>Grus americana</i>
Yellow-billed cuckoo	<i>Coccyzus americanus</i>

If the Service can be of further assistance, contact Andrea Jackson of my staff at (303)275-2349.

Sincerely,



Susan Linner
Colorado Field Supervisor

Reference: SpeciesList/ RMNP

APPENDIX D

State Endangered, Threatened, and Rare Species of Rocky Mountain National Park

December 2004

Rocky Mountain National Park uses the following table to identify state endangered, threatened and rare species that must be protected if found within a proposed project site. Federally threatened, endangered and candidate species are maintained separately from state listed species.

Agencies have a variety of ways of tracking and measuring the biological imperilment of species. The Colorado Wildlife Commission determines if a given specie needs protection under state laws. Four primary categories are applicable to Rocky Mountain National Park:

State Status Codes

- E State Endangered** – Listed as endangered by the Colorado Division of Wildlife. Those species or subspecies of native wildlife whose prospects for survival or recruitment within Colorado are in jeopardy, as determined by the Commission. State endangered species have legal protection under Colorado Revised Statutes 33-2-105 Article 2.
- T State Threatened** – Listed as threatened by the Colorado Division of Wildlife. Those species or subspecies of native wildlife which, as determined by the Commission, are not in immediate jeopardy of extinction but are vulnerable because they exist in such small numbers, are so extremely restricted in their range, or are experiencing such low recruitment or survival that they may become extinct. State threatened species have legal protection under Colorado Revised Statutes 33-2-105 Article 2.
- SC State Special Concern** – Those species or subspecies of native wildlife that have been removed from the state threatened or endangered list within the last five years; are proposed for federal listing (or a federal listing "candidate species") and are not already state listed; have experienced, based on the best available data, a downward trend in numbers or distribution lasting at least five years that may lead to an endangered or threatened status; or are otherwise determined to be vulnerable in Colorado.

The Colorado Natural Heritage Program (CNHP), based in Fort Collins manages a large database and ranking system for Colorado species. The database can be accessed through the Internet at www.cnhp.colostate.edu. The CNHP ranking system has two primary components – a ranking for the global status of the specie (G), and a ranking for that part of the range found within the state (S). Numeric extensions are added to these on a scale of 1 (critically imperiled) to 5 (demonstrably secure). A reference that CNHP uses to identify global status of a species is an online encyclopedia of life maintained by NatureServe at <http://www.natureserve.org/>

Natural Heritage ranks should not be interpreted as legal designations. Although most species protected under state or federal endangered species laws are extremely rare, not all rare species receive legal protection. National Park Service policies and guidelines require the preservation and protection of all native species.

Partners in Flight (PIF) developed a North American Landbird Conservation Plan in 2004. This plan provides a continental synthesis of priorities, objectives and rankings that will guide landbird conservation actions at national and international scales. PIF rankings are identified in the column with CNHP global rank codes. Only those species that have a state rank by CNHP are identified. A list of all PIF landbird species of continental importance, watch listed species, and stewardship species that occur in the Park are maintained separately from federal and state listed species.

Global Rank Codes

- G1** Critically imperiled globally because of rarity (5 or fewer occurrences in the world; or 1,000 or fewer individuals), or because of some factor of its biology makes it especially vulnerable to extinction.
- G2** Imperiled globally because of rarity (6 to 20 occurrences, or 1,000 to 3,000 individuals), or because other factors demonstrably make it very vulnerable to extinction throughout its range.
- G3** Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences, or 3,000 to 10,000 individuals).
- G4** Apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery, usually more than 100 occurrences and 10,000 individuals.
- G5** Demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery.
- G#T#** Trinomial rank (T) is used for subspecies or varieties. These taxa are ranked on the same criteria as G1-G5.
- GQ** Indicates uncertainty about taxonomic status.
- G#?** Indicates uncertainty about an assigned global rank.

North American Landbird Conservation Plan (RMNP is within the Intermountain West Avifaunal Biome, Bird Conservation Region 16)

- GW** Partners in Flight Watch List Species, with at least 10% of their global population in the Intermountain West Avifaunal Biome. A watch listed species are those birds warranting attention due to concerns related to declining populations, and distinct threats to habitat.
- GS** Partners in Flight Stewardship Species with $\geq 75\%$ of their global population in the Intermountain West Avifaunal Biome. A stewardship species are those birds that have small or restricted ranges.

State Rank Codes

- S1** Critically imperiled state because of rarity (5 or fewer occurrences in the world; or 1,000 or fewer individuals), or because of some factor of its biology makes it especially vulnerable to extinction.
- S2** Imperiled state because of rarity (6 to 20 occurrences, or 1,000 to 3,000 individuals), or because other factors demonstrably make it very vulnerable to extinction throughout its range.
- S3** Vulnerable through its range within a state or found locally in a restricted range (21 to 100 occurrences, or 3,000 to 10,000 individuals).
- S4** Apparently secure within the state, though it might be quite rare in parts of its range, especially at the periphery, usually more than 100 occurrences and 10,000 individuals.
- S5** Demonstrably secure within the state, although it may be quite rare in parts of its range, especially at the periphery.
- S#B** Refers to the breeding season imperilment of species that are not permanent residents.
- S#N** Refers to the non-breeding season imperilment of species that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used.
- SH** Historically known, but usually not verified for an extended period of time and could be extirpated from the park or the state.
- SNR** Not yet ranked in the state due to lack of information.
- SX** Presumed extirpated from within the state.
- S#?** Indicates uncertainty about an assigned state rank.

The Rocky Mountain National Park list of state Endangered, Threatened, and Rare Species does not include State Ranks Codes S4 and S5 because these rankings indicate that the specie is apparently or demonstrably secure within the state. The RMNP list is updated annually. If a specie is listed as unconfirmed, it means it occurred historically and is presently not confirmed; or has never been confirmed in the park, but the park has the appropriate habitat is within the species elevation range, and it has been confirmed in the counties the park occupies.

Scientific Name	Common Name	Time of Occurrence in RMNP	State Status	CNHP, PIF Rank	
				Global	State
Amphibians					
Bufo boreas pop1	Boreal toad (Southern Rocky Mountain Population)	All year	E	G4T1Q	S1
Rana sylvatica	Wood Frog	All year		G5	S3
Birds					
Accipiter gentilis	Northern goshawk	All year		G5	S3B
Aegolius funereus	Boreal owl	All year		G5	S2
Amphispiza belli?	Sage sparrow	Summer or migrant		G5,GS	S3B
Bucephala islandica	Barrow's goldeneye	Winter or migrant	SC	G5	S2B
Buteo regalis	Ferruginous hawk	Migrant	SC	G4	S3B, S4N
Calcarius mccownii	Mccown's longspur	Migrant		G5, GW	S2B
Catharus fuscescens	Veery	Summer or migrant		G5	S3B
Catoptrophorus semipalnatus	Willet	Migrant		G5	S1B
Coccyzus americanus occidentalis (unconfirmed)	Western Yellow-billed cuckoo	Accidental, two recorded occurrences, 1947 & 1980		G5T3	SNA
Cypseloides niger	Black swift	Summer		G4, GW	S3B
Dendroica graciae	Grace's warbler	Accidental, one recorded occurrence, 1990		G5	S3B
Dolichonyx oryzivorus	Bobolink	Accidental, summer or migrant		G5	S3B
Egretta thula	Snowy Egret	Migrant or rare summer		G5	S2B
Falco peregrinus anatum	American peregrine falcon	Summer or migrant	SC	G4T3	S2B
Glaucidium gnoma	Northern pygmy owl	All year		G5	S3B
Grus canadensis tabida	Greater sandhill crane	Summer or migrant	SC	G5T4	S2B, S4N
Haliaeetus leucocephalus	Bald eagle	All year	T	G4	S1B, S3N
Leucosticte australis	Brown-capped rosy-finch	All year		G4, GW	S3B, S4N
Loxia leucoptera	White-winged crossbill	All year, Irregular visitor		G5	S1B
Numenius americanus	Long-billed curlew	Migrant	SC	G5	S2B
Pelecanus	American white	Migrant	SC	G3	S1B

Scientific Name	Common Name	Time of Occurrence in RMNP	State Status	CNHP, PIF Rank	
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<i>erythrorhynchus</i>	pelican				
<i>Plegadis chihi</i>	White-faced ibis	Migrant		G5	S2B
<i>Seiurus aurocapillus</i>	Ovenbird	Rare summer or rare migrant		G5	S2B
<i>Sterna forsteri</i>	Forster's tern	Migrant		G5	S2B
<i>Strix occidentalis lucida</i> (Unconfirmed)	Mexican spotted owl	All Year	T	G3T3, GW	S1B, SUN
Fish					
<i>Oncorhynchus clarki pleuriticus</i>	Colorado River cutthroat Trout	All year	SC	G4T3	S3
<i>Oncorhynchus clarki stomias</i>	Greenback cutthroat trout	All year	T	G4T2T3	S2
Mammals					
<i>Canis lupis</i> (unconfirmed)	Gray wolf			G4	SX
<i>Lynx canadensis</i>	Lynx	All year	E	G5	S1
<i>Gulo gulo</i> (unconfirmed)	Wolverine	All year	E	G4	S1
<i>Plecotus townsendii pallescens</i>	Townsend's big-eared bat	All Year		G4T4	S2
<i>Sorex hoyi montanus</i>	Pygmy shrew	All year		G5T2 T3	S2
<i>Sorex nanus</i>	Dwarf shrew	All year		G4	S2
<i>Ursus arctos</i> (unconfirmed)	Grizzly or Brown bear			G4	SX
Invertebrates (Insects)					
<i>Hyles galli</i>	Galium sphinx moth	Summer		G5	S3?
<i>Paratrytone snowi</i>	Snow's skipper	Summer		G5	S3
<i>Pyrgus ruralis</i>	Two-banded skipper	Summer		G4	S3
Mollusk					
<i>Acroloxus coloradensis</i>	Rocky mountain capshell	All year	SC	G1G2	S1
Lichens					
<i>Brachythecium ferruginascens</i>				G4	S1S3
<i>Bryum alpinum</i>				G4G5	S1S3
Mosses					
<i>Andreaea heinemannii</i>				G3G5	S1S3
<i>Andreaea rupestris</i>				G5	S1S3
<i>Aulacomnium palustre</i> var. <i>imbricatum</i>				G5TNR	S1S3
<i>Campylopus schimperi</i>				G3G4	S1S3
<i>Grimmia teretinervis</i>				G3G5	S1S3
<i>Hylocomiastrum pyrenaicum</i>				G4G5	S1S3
<i>Hylocomium alaskanum</i>				G5	S1S3
<i>Leptopterigynandrum austro-alpinum</i>				G5	S1S3
<i>Mnium blyttii</i>				G5	S1S3
<i>Oreas martiana</i>				G5?	S1S3
<i>Plagiothecium cavifolium</i>				G5	S1S3

Scientific Name	Common Name	Time of Occurrence in RMNP	State Status	CNHP, PIF Rank	
				Global	State
<i>Pleurozium schreberi</i>	Feathermoss			G5	S1S3
<i>Pohila tundrae</i>				G2G3	S1S3
<i>Rhytidium rugosum</i>	Golden Glade-moss			G5	S1S3
<i>Roellia roellii</i>				G5	S1S3
<i>Sphagnum contortum</i>	Sphagnum			G5	S1S3
Liverworts					
<i>Gymnomitrium coralloides</i>				G4G5	S1S3
Plants					
<i>Aletes humilis</i> (unconfirmed)	Larimer aletes			G2G3	S2S3
<i>Aquilegia saximontana</i>	Rocky Mountain columbine			G3	S3
<i>Artemisia pattersonii</i>	Patterson's wormwood			G3G4	S3
<i>Asplenium septentrionale</i>	Grass-fern			G4G5	S3S4
<i>Botrychium echo</i>	Reflected moonwort			G3	S3
<i>Botrychium hesperium</i>	Western moonwort			G3	S2
<i>Botrychium lanceolatum</i> var <i>lanceolatum</i>	Lance-leaved moonwort			G5T4	S3
<i>Botrychium lunaria</i>	Common Moonwort			G5	S3
<i>Botrychium minganense</i>	Mingan's moonwort			G4	S1
<i>Carex diandra</i>	Lesser paniced sedge			G5	S1
<i>Carex leptalea</i>	Bristle-stalk sedge			G5	S1
<i>Carex limosa</i>	Mud sedge			G5	S2
<i>Carex oreocharis</i>	A sedge			G3	S1
<i>Carex stenoptila</i>	River bank sedge			G2	S2?
<i>Castilleja puberula</i>	Downy Indian-paintbrush			G2G3	SNR
<i>Chionophila jamesii</i>	Rocky mountain snowlover			G4?	S3S4
<i>Cyripedium fasciculatum</i>	Purple's lady's-slipper			G4	S3
<i>Cystopteris montana</i>	Mountain bladder fern			G5	S1
<i>Draba crassa</i>	Thick-leaf whitlow-grass			G3	S3
<i>Draba fladnizensis</i>	Arctic Draba			G4	S2S3
<i>Draba grayana</i>	Gray's peak whitlow-grass			G2	S2
<i>Draba porsildii</i>	Porsild's Whitlow-grass			G3G4	S1

Scientific Name	Common Name	Time of Occurrence in RMNP	State Status	CNHP, PIF Rank	
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<i>Draba streptobrachia</i>	Colorado Divide whitlow-grass			G3	S3
<i>Drymaria effusa</i> var. <i>depressa</i>	Spreading drymaria			G4T4	SNR
<i>Dryopteris expansa</i>	Spreading wood fern			G5	S1
<i>Erocallis triphylla</i>	Dwarf Spring Beauty			G4?	S2
<i>Hippochaete variegata</i>	Variegated scouringrush			G5	S1
<i>Isoetes tenella</i>	Spiny-spored quillwort			G5?T5?	S2
<i>Juncus tweedyi</i>	Tweedy rush			G3Q	S1
<i>Juncus vaseyi</i>	Vasey bulrush			G5?	S1
<i>Lewisia rediviva</i>	Bitterroot			G5	S2
<i>Liatris ligulistylis</i>	Gay-feather			G5?	S1S2
<i>Lilium philadelphicum</i>	Wood lily			G5	S3S4
<i>Listera borealis</i>	Northern twayblade			G4	S2
<i>Listera convallarioides</i>	Broad-Leaved twayblade			G5	S2
<i>Luzula subcapitata</i>	Colorado wood-rush			G3?	S3?
<i>Mimulus gemmiparus</i>	Weber monkey flower			G1	S1
<i>Minuartica stricta</i>	Rock sandwort			G5	S1
<i>Lysimachia thrysiflora</i>	Tufted Loosetrife			G5	SH
<i>Mentzelia sinuata</i>	Wavy-leaf stickleaf			G3	S2
<i>Nuttallia speciosa</i>	Jeweled blazingstar			G3?	S3?
<i>Papaver radicum</i> spp. <i>Kluanense</i>	Alpine poppy			G5T3 T4	S3S4
<i>Parnassia kotzebuei</i>	Kotzebue grass-of-parnassus			G4	S2
<i>Penstemon harbourii</i>	Harbour beardtongue			G3	S3S4
<i>Polypodium hesperium</i>	Western polypody			G5	S1S2
<i>Potentilla rupicola</i>	Rocky mountain cinquefoil			G5?T2	S2
<i>Pyrola picta</i> (unconfirmed)	Pictureleaf wintergreen			G4G5	S3S4
<i>Salix serissima</i>	Autumn willow			G4	S1
<i>Silene kingii</i>	King's campion			G2G4Q	S1
<i>Sisyrinchium pallidum</i>	Pale blue-eyed grass			G2G3	S2
<i>Telesonix jamesii</i>	James' telesonix			G2G3	S2?
<i>Tonestus lyallii</i>	Lyall			G5	S1

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	haplopappus				
<i>Viola Selkirkii</i>	Selkirk violet			G5?	S1

APPENDIX E

List of sources used by Rocky Mountain National Park to identify Endangered, Threatened and Rare Species

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